APPENDIX G

Fluvial Geomorphology

For figures, tables, and text from Rosgen applied to this portion of the study, especially pages 5-6, 6-29, 6-30, and 8-9, refer to: Rosgen. D. L. 1996. Applied River Morphology. Printed Media Companies, Minneapolis, Minnesota.

Appendix G-1. Pebble count data for various sites throughout the Long Creek and Red Brook watersheds. Note: These sites were included in the counts to show the range of conditions found throughout the watersheds, and they were not intended to be representative of the actual proportion of sites in the study watersheds having various types of stream bottom material characteristics.

Definition of Terms for Pebble Counts Made in the Long Creek & Red Brook Watersheds

Category Observed in the Field	Abbreviation	Approximate Size Class*
Sand	SA	0.0380 cm
Fine-Sand/Silt/Clay mix	SC	~0.0100 cm
Clay (solid)	C	~0.0050 cm
Bedrock	BR	Don't use to calculate mean particle size, but do use in particle-size-distribution discussion

Note: Because pebble counts were used as the field technique to characterize the substrate of these streams, as opposed to doing sieve analyses of stream bottom materials, these general definitions were used to categorize basic types of materials encountered in the field.

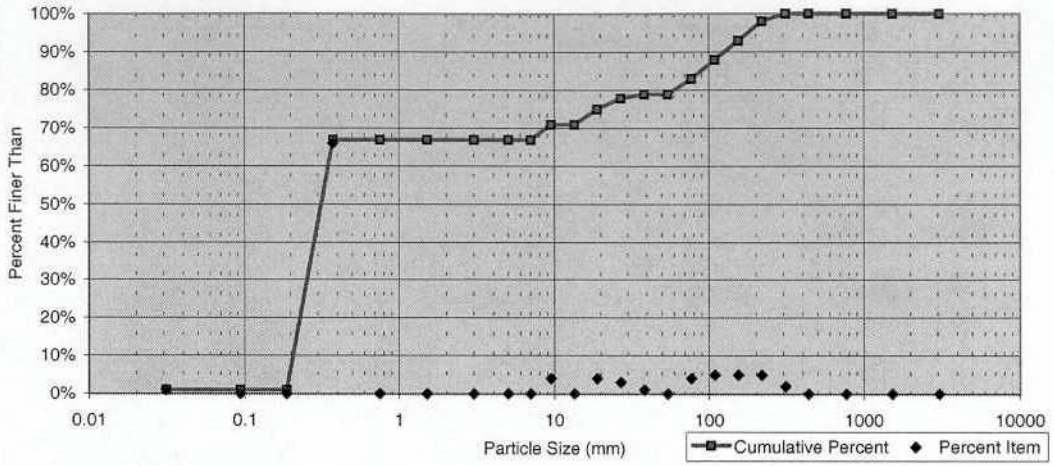
*Mean particle size for specified category, as defined in Rosgen 1996

1

Material	Size Range (mm)		Count
silt/clay	0	0.062	1
very fine sand	0.062	0.13	0
fine sand	0.13	0.25	0
medium sand	0.25	0.5	66
coarse sand	0.5	1	0
very coarse sand	1	2	0
very fine gravel	2	4	0
fine gravel	4	6	0
fine gravel	6	8	0
medium gravel	8	11	4
medium gravel	11	16	0
coarse gravel	16	22	4
coarse gravel	22	32	3
very coarse gravel	32	45	1
very coarse gravel	45	64	0
small cobble	64	90	4
medium cobble	90	128	5
large cobble	128	180	5
very large cobble	180	256	5
small boulder	256	362	2
small boulder	362	512	0
medium boulder	512	1024	0
large boulder	1024	2048	0
very large boulder	2048	4096	0
bedrock			
	Total Particle Count:		100

LC-N-0.404

Note: There was a stormwater outfall upstream of this reach, which may have contributed large substrate (such as cobbles), to the upstream portion of this reach.



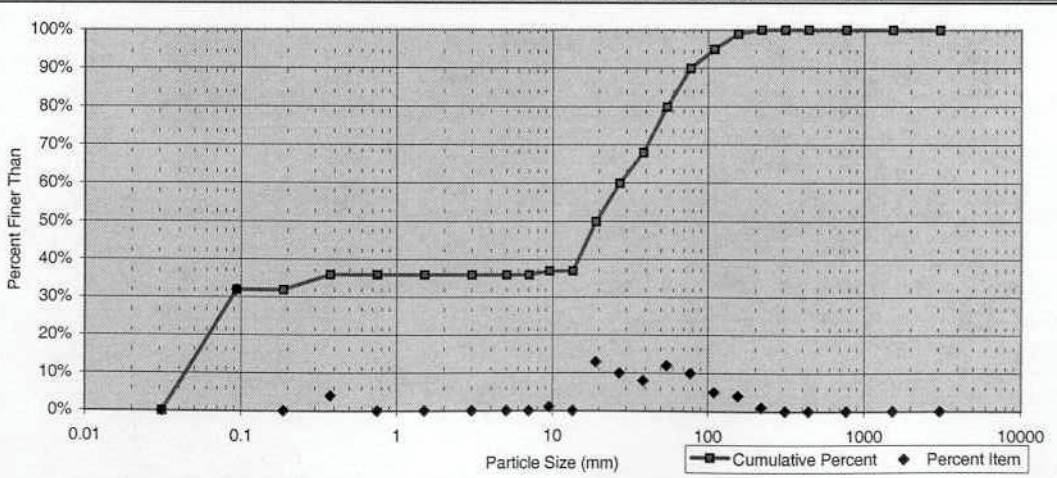
Size percent less than (mm)				
D16	D35	D50	D84	D95
0.22	0.27	0.31	82.54	176.97

Percent by substrate type					
pan clay	silty-fine sand or sand	gravel	cobble	boulder	bedrock
1%	66%	12%	19%	2%	0%

Material	Size Range (mm)		Count
silt/clay	0	0.062	0
very fine sand	0.062	0.13	32
fine sand	0.13	0.25	0
medium sand	0.25	0.5	4
coarse sand	0.5	1	0
very coarse sand	1	2	0
very fine gravel	2	4	0
fine gravel	4	6	0
fine gravel	6	8	0
medium gravel	8	11	1
medium gravel	11	16	0
coarse gravel	16	22	13
coarse gravel	22	32	10
very coarse gravel	32	45	8
very coarse gravel	45	64	12
small cobble	64	90	10
medium cobble	90	128	5
large cobble	128	180	4
very large cobble	180	256	1
small boulder	256	362	0
small boulder	362	512	0
medium boulder	512	1024	0
large boulder	1024	2048	0
very large boulder	2048	4096	0
bedrock			
	Total Particle Count:		100

LC-M-0.533

Note: Cobble-rich section immediately downstream of Foden Road crossing. It appears, and an old MDIFW photograph confirms, to be channel armoring below the road culvert.



Size percent less than (mm)				
D16	D35	D50	D84	D95
0.05	0.32	19.00	62.58	109.00

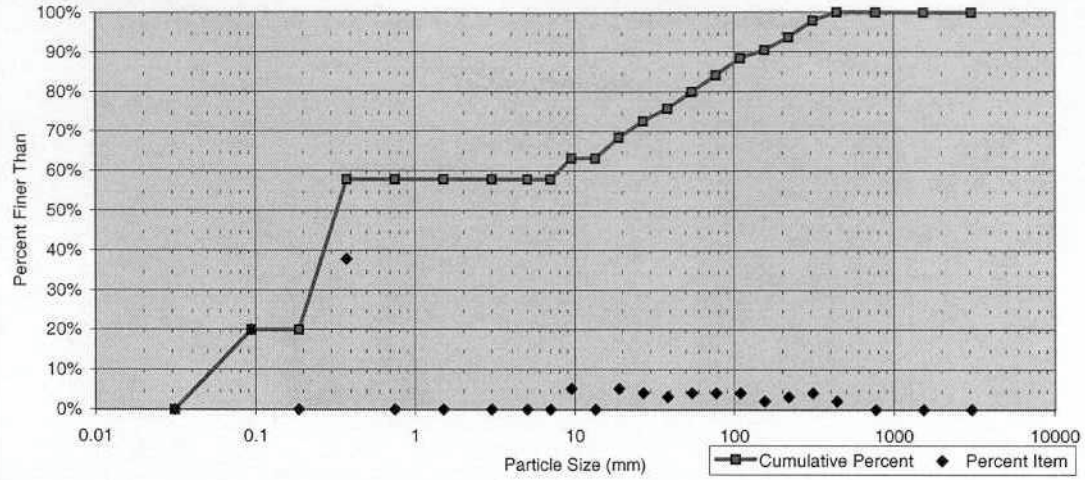
Percent by substrate type					
pan clay	silty-fine sand or sand	gravel	cobble	boulder	bedrock
0%	36%	44%	20%	0%	0%

2

Material	Size Range (mm)		Count
silt/clay	0	0.062	0
very fine sand	0.062	0.13	19
fine sand	0.13	0.25	0
medium sand	0.25	0.5	36
coarse sand	0.5	1	0
very coarse sand	1	2	0
very fine gravel	2	4	0
fine gravel	4	6	0
fine gravel	6	8	0
medium gravel	8	11	5
medium gravel	11	16	0
coarse gravel	16	22	5
coarse gravel	22	32	4
very coarse gravel	32	45	3
very coarse gravel	45	64	4
small cobble	64	90	4
medium cobble	90	128	4
large cobble	128	180	2
very large cobble	180	256	3
small boulder	256	362	4
small boulder	362	512	2
medium boulder	512	1024	0
large boulder	1024	2048	0
very large boulder	2048	4096	0
bedrock			5
	Total Particle Count:		100

Note: **LC-M-0.432**

This site is about 100 m downstream of a culvert. There does appear to be some exposed ledge in this area, which may be responsible for the presence of bedrock, boulder, and cobble values.

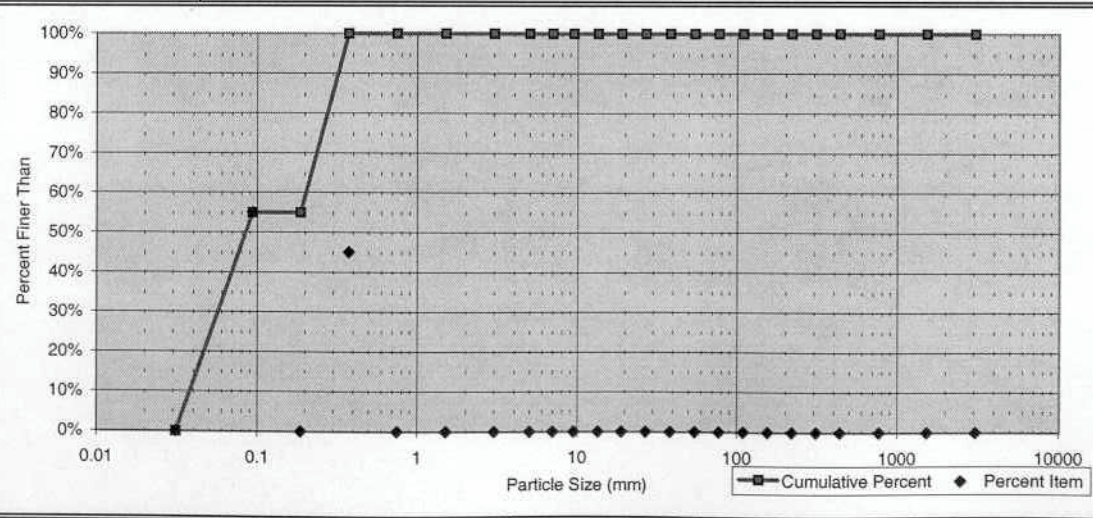


Size percent less than (mm)				
D16	D35	D50	D84	D95
0.07	0.25	0.32	75.68	243.11

Percent by substrate type					
pan clay	silty-fine sand or sand	gravel	cobble	boulder	bedrock
0%	55%	21%	13%	6%	5%

Material	Size Range (mm)		Count
silt/clay	0	0.062	0
very fine sand	0.062	0.13	55
fine sand	0.13	0.25	0
medium sand	0.25	0.5	45
coarse sand	0.5	1	0
very coarse sand	1	2	0
very fine gravel	2	4	0
fine gravel	4	6	0
fine gravel	6	8	0
medium gravel	8	11	0
medium gravel	11	16	0
coarse gravel	16	22	0
coarse gravel	22	32	0
very coarse gravel	32	45	0
very coarse gravel	45	64	0
small cobble	64	90	0
medium cobble	90	128	0
large cobble	128	180	0
very large cobble	180	256	0
small boulder	256	362	0
small boulder	362	512	0
medium boulder	512	1024	0
large boulder	1024	2048	0
very large boulder	2048	4096	0
bedrock			0
	Total Particle Count:		100

Note: **LC-S-0.369**



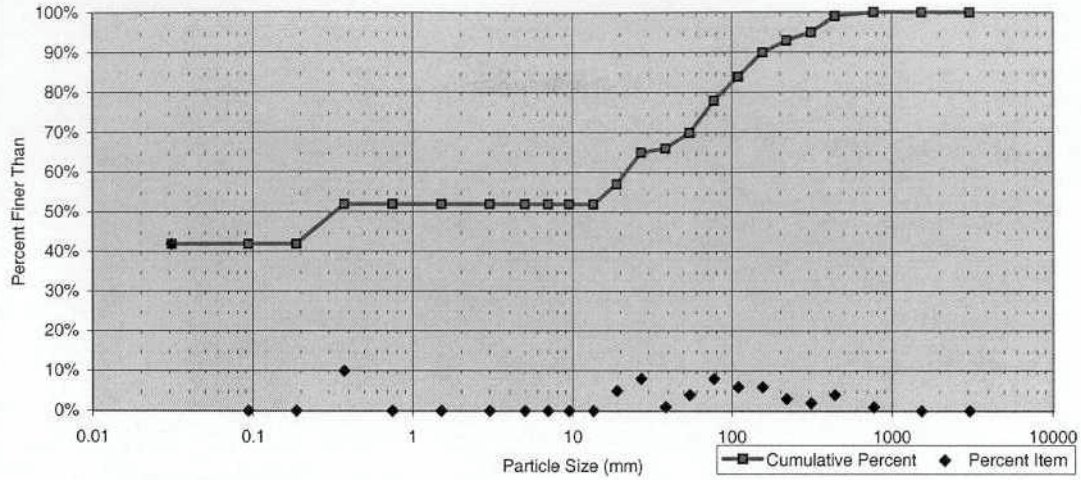
Size percent less than (mm)				
D16	D35	D50	D84	D95
0.04	0.06	0.08	0.29	0.35

Percent by substrate type					
pan clay	silty-fine sand or sand	gravel	cobble	boulder	bedrock
0%	100%	0%	0%	0%	0%

3

Material	Size Range (mm)		Count
silt/clay	0	0.062	42
very fine sand	0.062	0.13	0
fine sand	0.13	0.25	0
medium sand	0.25	0.5	10
coarse sand	0.5	1	0
very coarse sand	1	2	0
very fine gravel	2	4	0
fine gravel	4	6	0
fine gravel	6	8	0
medium gravel	8	11	0
medium gravel	11	16	0
coarse gravel	16	22	5
coarse gravel	22	32	8
very coarse gravel	32	45	1
very coarse gravel	45	64	4
small cobble	64	90	8
medium cobble	90	128	6
large cobble	128	180	6
very large cobble	180	256	3
small boulder	256	362	2
small boulder	362	512	4
medium boulder	512	1024	1
large boulder	1024	2048	0
very large boulder	2048	4096	0
bedrock			0
	Total Particle Count:		100

Note: **LC-S-0.460~**
This section is beneath a large stormwater outlet for Maine Mall-area drainage. The channel in this section appears to have been heavily armored.

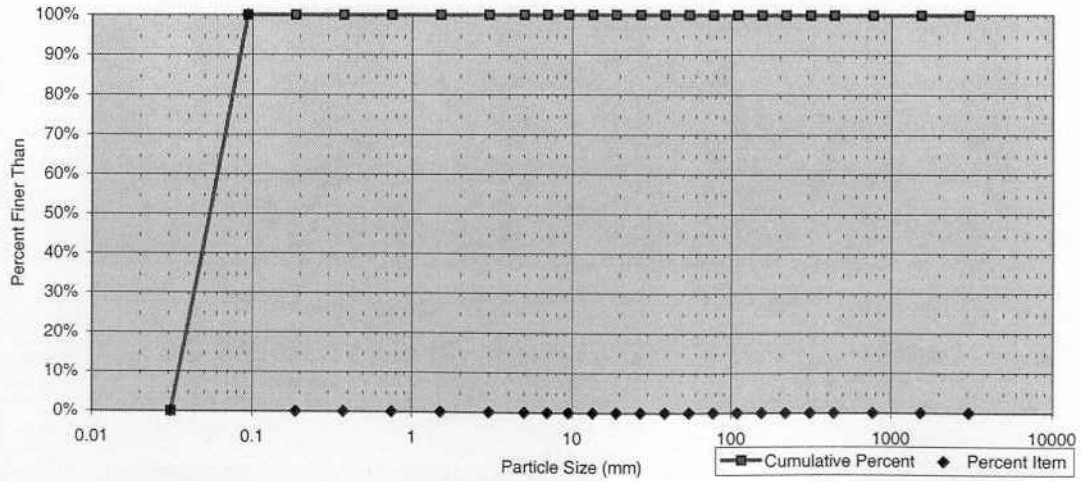


Size percent less than (mm)				
D16	D35	D50	D84	D95
#N/A	#N/A	0.33	109.00	309.00

Percent by substrate type					
pan clay	silty-fine sand or sand	gravel	cobble	boulder	bedrock
42%	10%	18%	23%	7%	0%

Material	Size Range (mm)		Count
silt/clay	0	0.062	0
very fine sand	0.062	0.13	100
fine sand	0.13	0.25	0
medium sand	0.25	0.5	0
coarse sand	0.5	1	0
very coarse sand	1	2	0
very fine gravel	2	4	0
fine gravel	4	6	0
fine gravel	6	8	0
medium gravel	8	11	0
medium gravel	11	16	0
coarse gravel	16	22	0
coarse gravel	22	32	0
very coarse gravel	32	45	0
very coarse gravel	45	64	0
small cobble	64	90	0
medium cobble	90	128	0
large cobble	128	180	0
very large cobble	180	256	0
small boulder	256	362	0
small boulder	362	512	0
medium boulder	512	1024	0
large boulder	1024	2048	0
very large boulder	2048	4096	0
bedrock			0
	Total Particle Count:		100

Note: **LC-S-0.496**



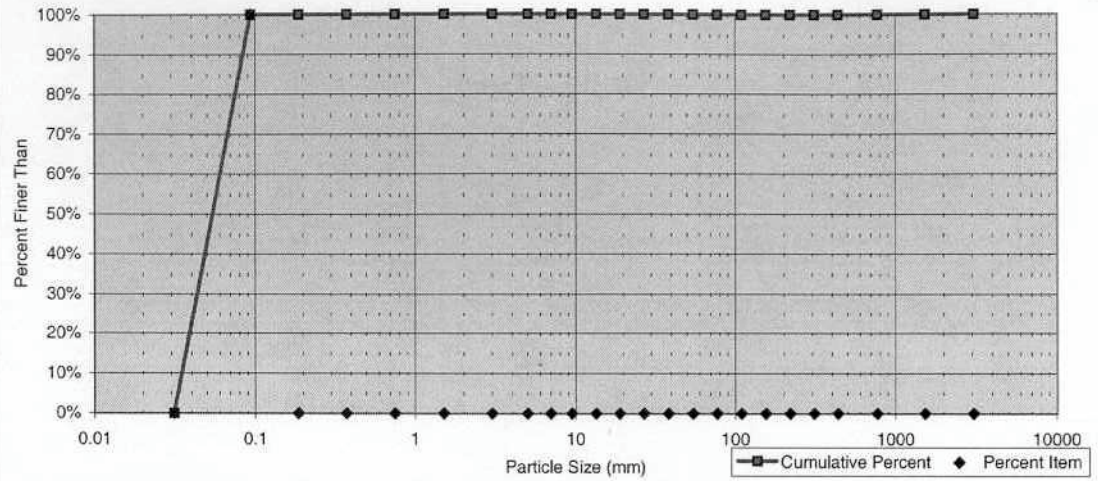
Size percent less than (mm)				
D16	D35	D50	D84	D95
0.04	0.05	0.05	0.08	0.09

Percent by substrate type					
pan clay	silty-fine sand or sand	gravel	cobble	boulder	bedrock
0%	100%	0%	0%	0%	0%

4

Material	Size Range (mm)		Count
silt/clay	0	0.062	0
very fine sand	0.062	0.13	100
fine sand	0.13	0.25	0
medium sand	0.25	0.5	0
coarse sand	0.5	1	0
very coarse sand	1	2	0
very fine gravel	2	4	0
fine gravel	4	6	0
fine gravel	6	8	0
medium gravel	8	11	0
medium gravel	11	16	0
coarse gravel	16	22	0
coarse gravel	22	32	0
very coarse gravel	32	45	0
very coarse gravel	45	64	0
small cobble	64	90	0
medium cobble	90	128	0
large cobble	128	180	0
very large cobble	180	256	0
small boulder	256	362	0
small boulder	362	512	0
medium boulder	512	1024	0
large boulder	1024	2048	0
very large boulder	2048	4096	0
bedrock			0
Total Particle Count:			100

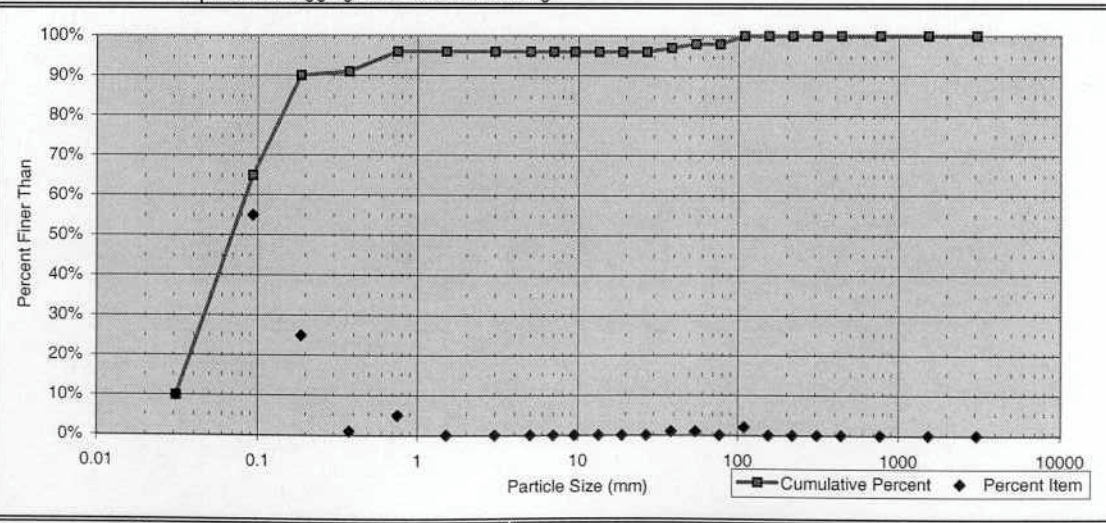
Note: **LC-M-3.098**



Size percent less than (mm)					Percent by substrate type					
D16	D35	D50	D84	D95	pan clay	silty-fine sand or sand	gravel	cobble	boulder	bedrock
0.04	0.05	0.05	0.08	0.09	0%	100%	0%	0%	0%	0%

Material	Size Range (mm)		Count
silt/clay	0	0.062	10
very fine sand	0.062	0.13	55
fine sand	0.13	0.25	25
medium sand	0.25	0.5	1
coarse sand	0.5	1	5
very coarse sand	1	2	0
very fine gravel	2	4	0
fine gravel	4	6	0
fine gravel	6	8	0
medium gravel	8	11	0
medium gravel	11	16	0
coarse gravel	16	22	0
coarse gravel	22	32	0
very coarse gravel	32	45	1
very coarse gravel	45	64	1
small cobble	64	90	0
medium cobble	90	128	2
large cobble	128	180	0
very large cobble	180	256	0
small boulder	256	362	0
small boulder	362	512	0
medium boulder	512	1024	0
large boulder	1024	2048	0
very large boulder	2048	4096	0
bedrock			0
Total Particle Count:			100

Note: **LC-M-1.653**
A small section of cooble and gravel was found in this section. It appeared to be remnants of an old logging road stream-crossing.

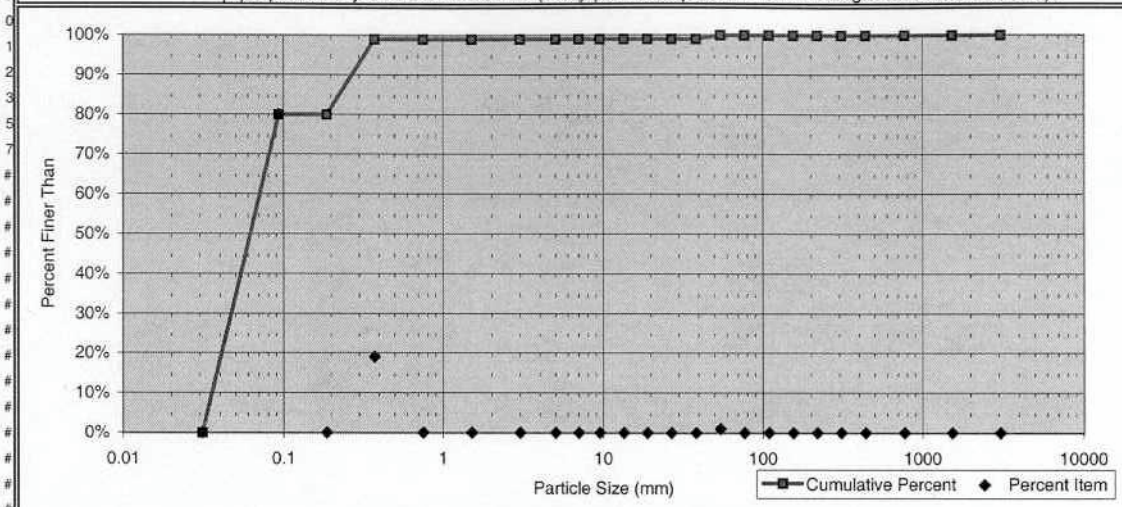


Size percent less than (mm)					Percent by substrate type					
D16	D35	D50	D84	D95	pan clay	silty-fine sand or sand	gravel	cobble	boulder	bedrock
0.03	0.05	0.07	0.16	0.65	10%	86%	2%	2%	0%	0%

5

Material	Size Range (mm)		Count
silt/clay	0	0.062	0
very fine sand	0.062	0.13	80
fine sand	0.13	0.25	0
medium sand	0.25	0.5	19
coarse sand	0.5	1	0
very coarse sand	1	2	0
very fine gravel	2	4	0
fine gravel	4	6	0
fine gravel	6	8	0
medium gravel	8	11	0
medium gravel	11	16	0
coarse gravel	16	22	0
coarse gravel	22	32	0
very coarse gravel	32	45	0
very coarse gravel	45	64	1
small cobble	64	90	0
medium cobble	90	128	0
large cobble	128	180	0
very large cobble	180	256	0
small boulder	256	362	0
small boulder	362	512	0
medium boulder	512	1024	0
large boulder	1024	2048	0
very large boulder	2048	4096	0
bedrock			0
Total Particle Count:			100

Note: **LC-M-0.603**
This section was upstream of the area where the channel had been filled in by large amount of riprap from adjacent streambanks (likely placed to protect the footbridge infrastructure here).

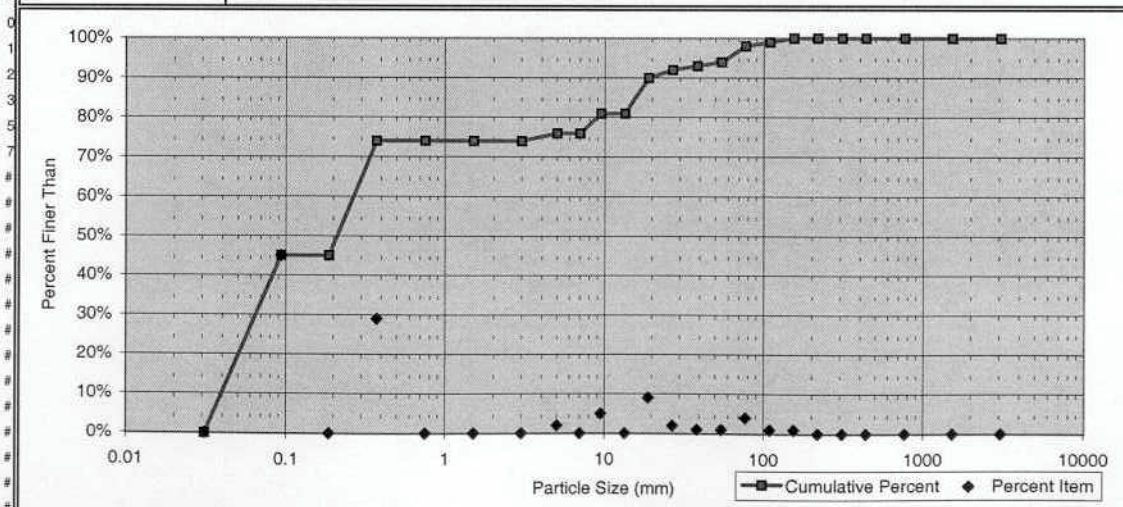


Size percent less than (mm)				
D16	D35	D50	D84	D95
0.04	0.05	0.06	0.22	0.32

Percent by substrate type					
pan clay	silty-fine sand or sand	gravel	cobble	boulder	bedrock
0%	99%	1%	0%	0%	0%

Material	Size Range (mm)		Count
silt/clay	0	0.062	0
very fine sand	0.062	0.13	45
fine sand	0.13	0.25	0
medium sand	0.25	0.5	29
coarse sand	0.5	1	0
very coarse sand	1	2	0
very fine gravel	2	4	0
fine gravel	4	6	2
fine gravel	6	8	0
medium gravel	8	11	5
medium gravel	11	16	0
coarse gravel	16	22	9
coarse gravel	22	32	2
very coarse gravel	32	45	1
very coarse gravel	45	64	1
small cobble	64	90	4
medium cobble	90	128	1
large cobble	128	180	1
very large cobble	180	256	0
small boulder	256	362	0
small boulder	362	512	0
medium boulder	512	1024	0
large boulder	1024	2048	0
very large boulder	2048	4096	0
bedrock			0
Total Particle Count:			100

Note: **LC-N-0.595**
Rubble in the stream may exist as a result of adjacent floodplain filling activities.



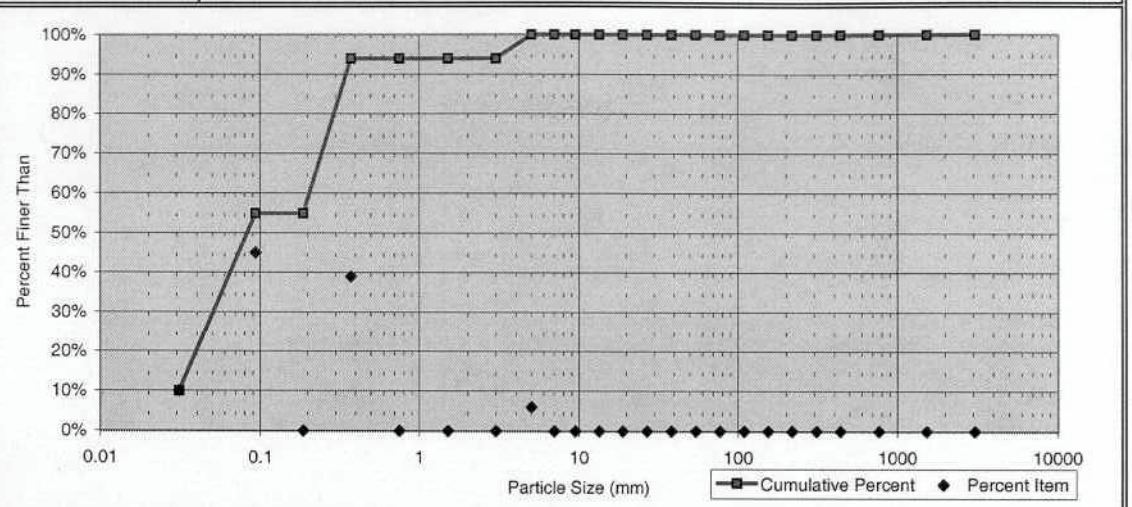
Size percent less than (mm)				
D16	D35	D50	D84	D95
0.05	0.07	0.21	15.13	59.42

Percent by substrate type					
pan clay	silty-fine sand or sand	gravel	cobble	boulder	bedrock
0%	74%	20%	6%	0%	0%

6

Material	Size Range (mm)		Count
silt/clay	0	0.062	10
very fine sand	0.062	0.13	45
fine sand	0.13	0.25	0
medium sand	0.25	0.5	39
coarse sand	0.5	1	0
very coarse sand	1	2	0
very fine gravel	2	4	0
fine gravel	4	6	6
fine gravel	6	8	0
medium gravel	8	11	0
medium gravel	11	16	0
coarse gravel	16	22	0
coarse gravel	22	32	0
very coarse gravel	32	45	0
very coarse gravel	45	64	0
small cobble	64	90	0
medium cobble	90	128	0
large cobble	128	180	0
very large cobble	180	256	0
small boulder	256	362	0
small boulder	362	512	0
medium boulder	512	1024	0
large boulder	1024	2048	0
very large boulder	2048	4096	0
bedrock			0
Total Particle Count:			100

Note: **LC-M-0.910**

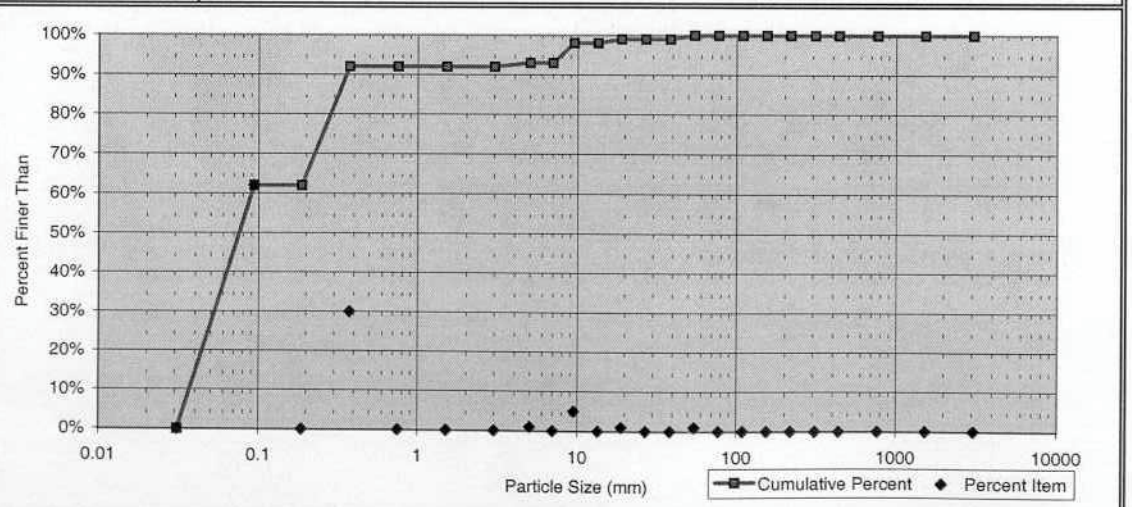


Size percent less than (mm)				
D16	D35	D50	D84	D95
0.04	0.06	0.08	0.31	3.27

Percent by substrate type					
pan clay	silty-fine sand or sand	gravel	cobble	boulder	bedrock
10%	84%	6%	0%	0%	0%

Material	Size Range (mm)		Count
silt/clay	0	0.062	0
very fine sand	0.062	0.13	62
fine sand	0.13	0.25	0
medium sand	0.25	0.5	30
coarse sand	0.5	1	0
very coarse sand	1	2	0
very fine gravel	2	4	0
fine gravel	4	6	1
fine gravel	6	8	0
medium gravel	8	11	5
medium gravel	11	16	0
coarse gravel	16	22	1
coarse gravel	22	32	0
very coarse gravel	32	45	0
very coarse gravel	45	64	1
small cobble	64	90	0
medium cobble	90	128	0
large cobble	128	180	0
very large cobble	180	256	0
small boulder	256	362	0
small boulder	362	512	0
medium boulder	512	1024	0
large boulder	1024	2048	0
very large boulder	2048	4096	0
bedrock			0
Total Particle Count:			100

Note: **LC-N-1.000 ~~**
A small stretch of pea gravel was found in this section.



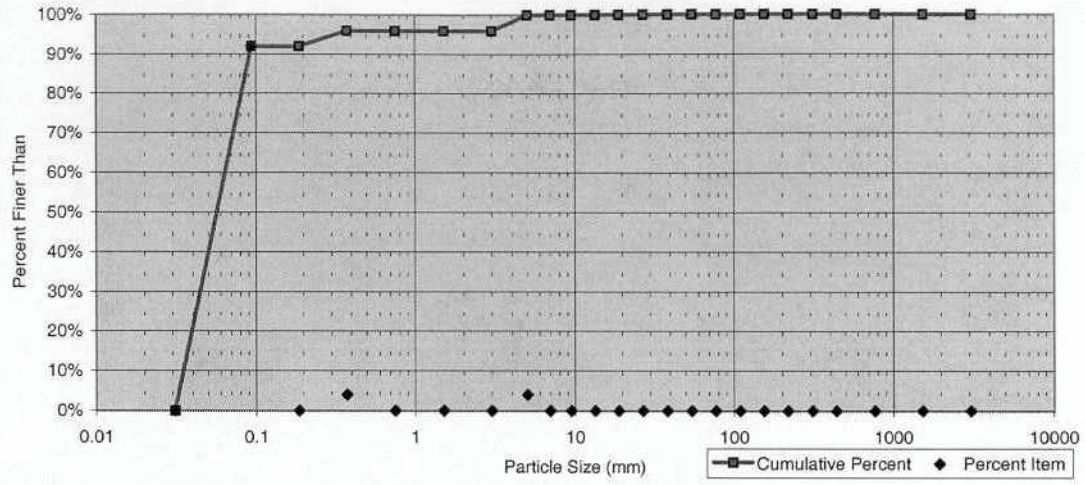
Size percent less than (mm)				
D16	D35	D50	D84	D95
0.04	0.06	0.08	0.31	7.91

Percent by substrate type					
pan clay	silty-fine sand or sand	gravel	cobble	boulder	bedrock
0%	92%	8%	0%	0%	0%

7

Material	Size Range (mm)		Count
silt/clay	0	0.062	0
very fine sand	0.062	0.13	92
fine sand	0.13	0.25	0
medium sand	0.25	0.5	4
coarse sand	0.5	1	0
very coarse sand	1	2	0
very fine gravel	2	4	0
fine gravel	4	6	4
fine gravel	6	8	0
medium gravel	8	11	0
medium gravel	11	16	0
coarse gravel	16	22	0
coarse gravel	22	32	0
very coarse gravel	32	45	0
very coarse gravel	45	64	0
small cobble	64	90	0
medium cobble	90	128	0
large cobble	128	180	0
very large cobble	180	256	0
small boulder	256	362	0
small boulder	362	512	0
medium boulder	512	1024	0
large boulder	1024	2048	0
very large boulder	2048	4096	0
bedrock			0
	Total Particle Count:		100

Note: **LC-Mn-2.274**

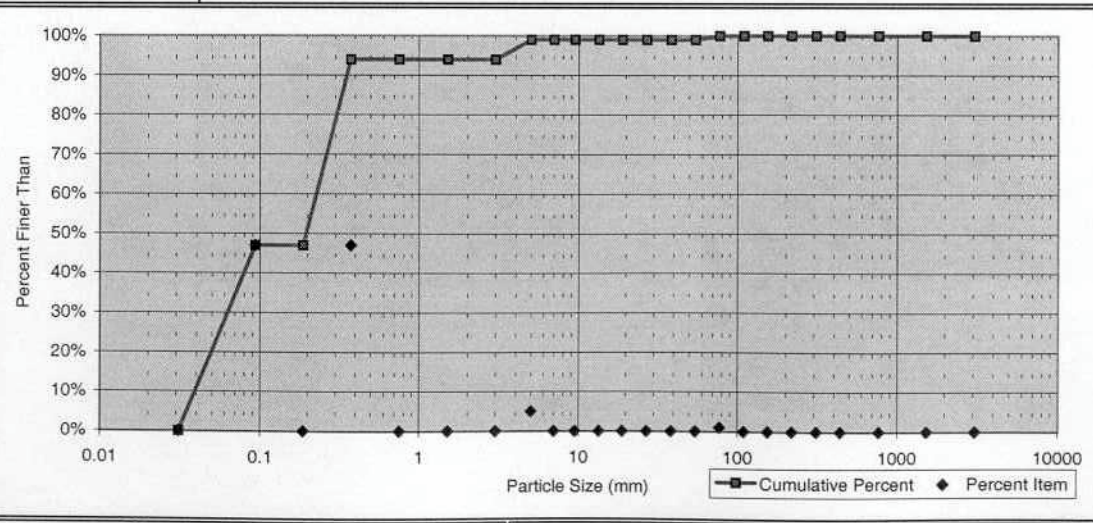


Size percent less than (mm)				
D16	D35	D50	D84	D95
0.04	0.05	0.06	0.08	0.32

Percent by substrate type					
pan clay	silty-fine sand or sand	gravel	cobble	boulder	bedrock
0%	96%	4%	0%	0%	0%

Material	Size Range (mm)		Count
silt/clay	0	0.062	0
very fine sand	0.062	0.13	47
fine sand	0.13	0.25	0
medium sand	0.25	0.5	47
coarse sand	0.5	1	0
very coarse sand	1	2	0
very fine gravel	2	4	0
fine gravel	4	6	5
fine gravel	6	8	0
medium gravel	8	11	0
medium gravel	11	16	0
coarse gravel	16	22	0
coarse gravel	22	32	0
very coarse gravel	32	45	0
very coarse gravel	45	64	0
small cobble	64	90	1
medium cobble	90	128	0
large cobble	128	180	0
very large cobble	180	256	0
small boulder	256	362	0
small boulder	362	512	0
medium boulder	512	1024	0
large boulder	1024	2048	0
very large boulder	2048	4096	0
bedrock			0
	Total Particle Count:		100

Note: **LC-Mn-3.224**
An apparently frelatively undisturbed stretch of woodland and stream.



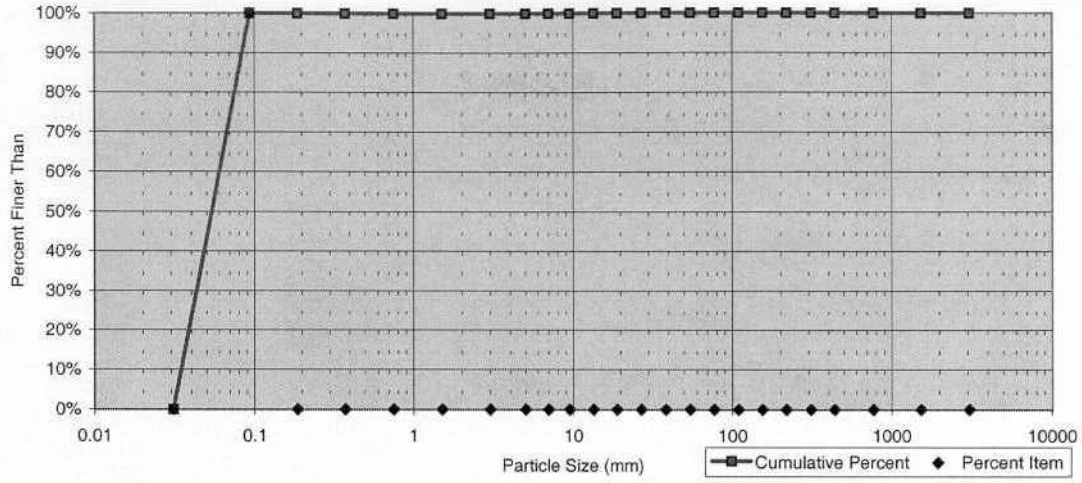
Size percent less than (mm)				
D16	D35	D50	D84	D95
0.05	0.07	0.20	0.32	3.32

Percent by substrate type					
pan clay	silty-fine sand or sand	gravel	cobble	boulder	bedrock
0%	94%	5%	1%	0%	0%

8

Material	Size Range (mm)		Count
silt/clay	0	0.062	0
very fine sand	0.062	0.13	100
fine sand	0.13	0.25	0
medium sand	0.25	0.5	0
coarse sand	0.5	1	0
very coarse sand	1	2	0
very fine gravel	2	4	0
fine gravel	4	6	0
fine gravel	6	8	0
medium gravel	8	11	0
medium gravel	11	16	0
coarse gravel	16	22	0
coarse gravel	22	32	0
very coarse gravel	32	45	0
very coarse gravel	45	64	0
small cobble	64	90	0
medium cobble	90	128	0
large cobble	128	180	0
very large cobble	180	256	0
small boulder	256	362	0
small boulder	362	512	0
medium boulder	512	1024	0
large boulder	1024	2048	0
very large boulder	2048	4096	0
bedrock			0
Total Particle Count:			100

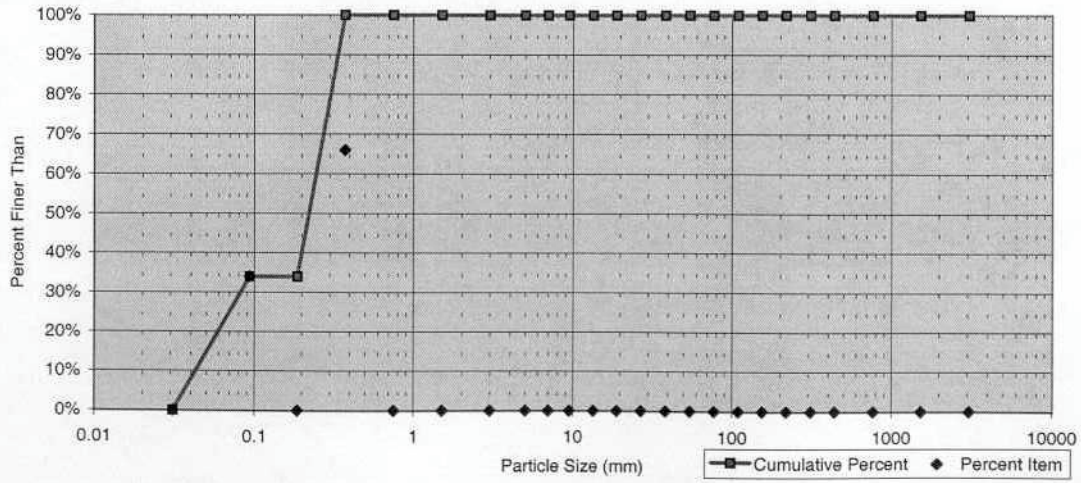
Note: **LC-Mw-2.896**



Size percent less than (mm)					Percent by substrate type					
D16	D35	D50	D84	D95	pan clay	silty-fine sand or sand	gravel	cobble	boulder	bedrock
0.04	0.05	0.05	0.08	0.09	0%	100%	0%	0%	0%	0%

Material	Size Range (mm)		Count
silt/clay	0	0.062	0
very fine sand	0.062	0.13	34
fine sand	0.13	0.25	0
medium sand	0.25	0.5	66
coarse sand	0.5	1	0
very coarse sand	1	2	0
very fine gravel	2	4	0
fine gravel	4	6	0
fine gravel	6	8	0
medium gravel	8	11	0
medium gravel	11	16	0
coarse gravel	16	22	0
coarse gravel	22	32	0
very coarse gravel	32	45	0
very coarse gravel	45	64	0
small cobble	64	90	0
medium cobble	90	128	0
large cobble	128	180	0
very large cobble	180	256	0
small boulder	256	362	0
small boulder	362	512	0
medium boulder	512	1024	0
large boulder	1024	2048	0
very large boulder	2048	4096	0
bedrock			0
Total Particle Count:			100

Note: **RB-1.434**

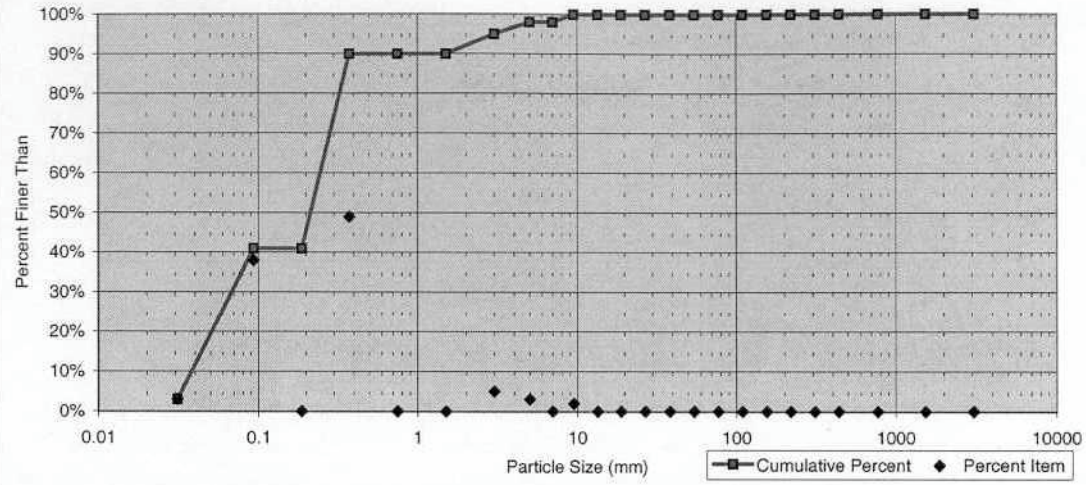


Size percent less than (mm)					Percent by substrate type					
D16	D35	D50	D84	D95	pan clay	silty-fine sand or sand	gravel	cobble	boulder	bedrock
0.05	0.19	0.22	0.32	0.36	0%	100%	0%	0%	0%	0%

9

Material	Size Range (mm)		Count
silt/clay	0	0.062	3
very fine sand	0.062	0.13	38
fine sand	0.13	0.25	0
medium sand	0.25	0.5	49
coarse sand	0.5	1	0
very coarse sand	1	2	0
very fine gravel	2	4	5
fine gravel	4	6	3
fine gravel	6	8	0
medium gravel	8	11	2
medium gravel	11	16	0
coarse gravel	16	22	0
coarse gravel	22	32	0
very coarse gravel	32	45	0
very coarse gravel	45	64	0
small cobble	64	90	0
medium cobble	90	128	0
large cobble	128	180	0
very large cobble	180	256	0
small boulder	256	362	0
small boulder	362	512	0
medium boulder	512	1024	0
large boulder	1024	2048	0
very large boulder	2048	4096	0
bedrock			0
Total Particle Count:			100

Note: **RB-2.119**

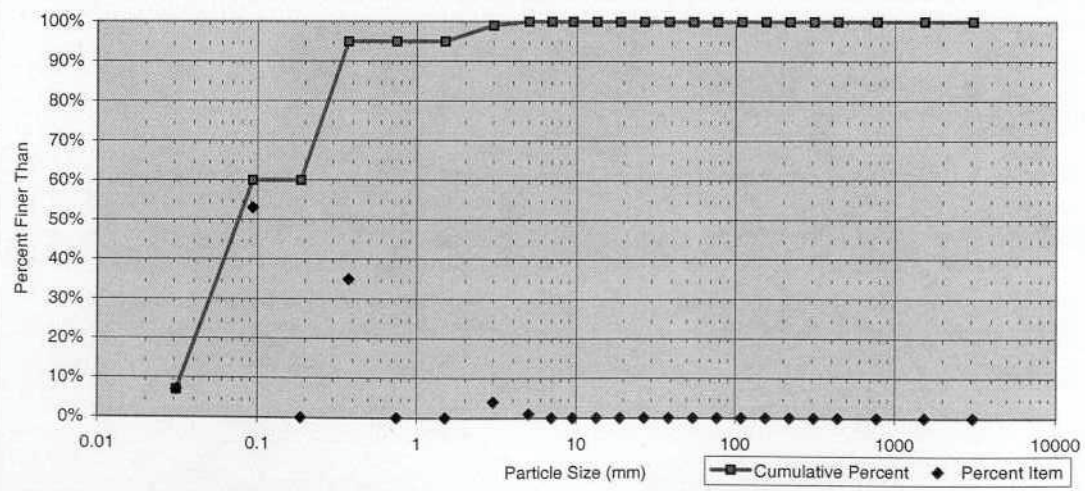


Size percent less than (mm)				
D16	D35	D50	D84	D95
0.05	0.08	0.21	0.34	3.00

Percent by substrate type					
pan clay	silty-fine sand or sand	gravel	cobble	boulder	bedrock
3%	87%	10%	0%	0%	0%

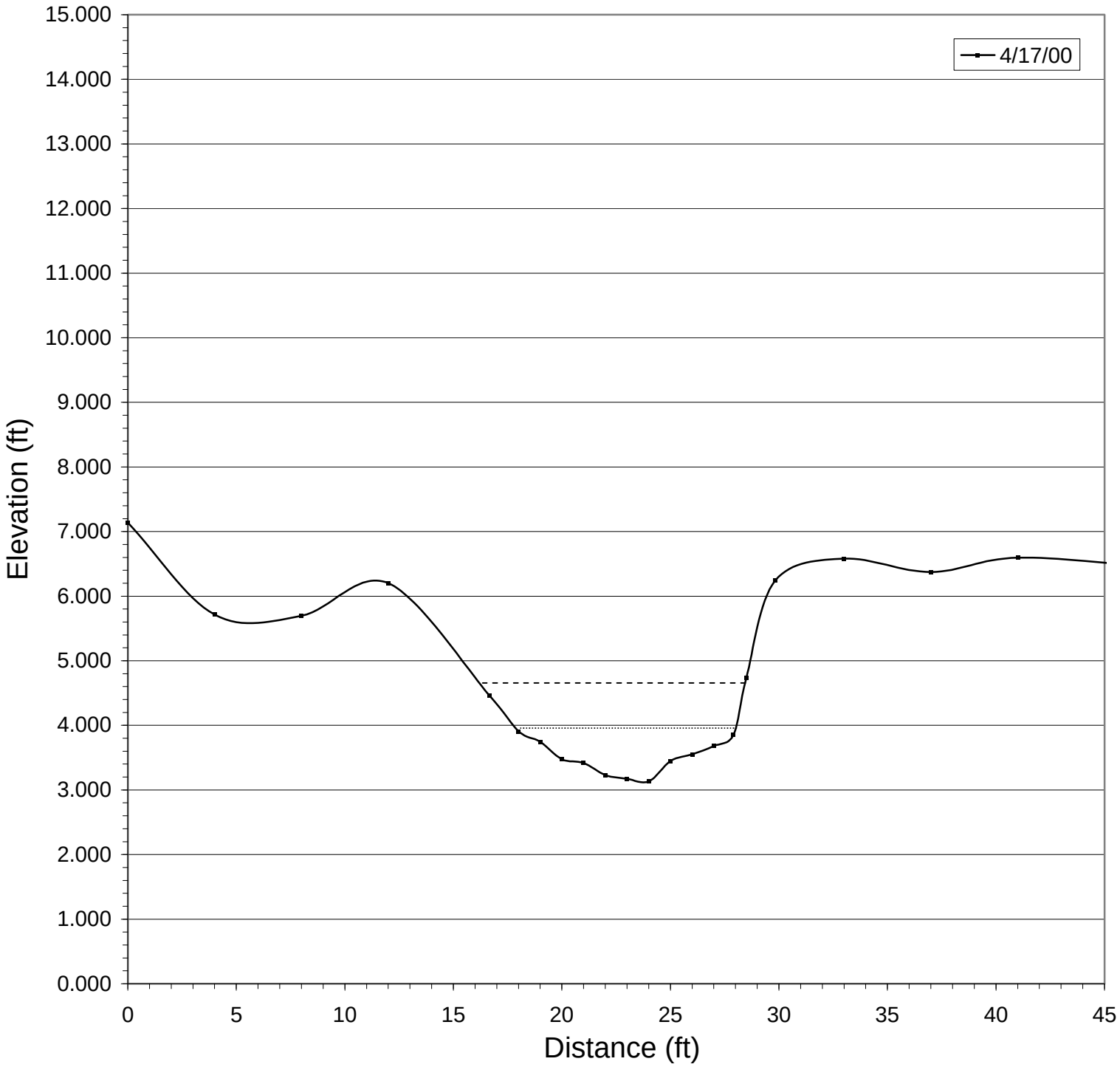
Material	Size Range (mm)		Count
silt/clay	0	0.062	7
very fine sand	0.062	0.13	53
fine sand	0.13	0.25	0
medium sand	0.25	0.5	35
coarse sand	0.5	1	0
very coarse sand	1	2	0
very fine gravel	2	4	4
fine gravel	4	6	1
fine gravel	6	8	0
medium gravel	8	11	0
medium gravel	11	16	0
coarse gravel	16	22	0
coarse gravel	22	32	0
very coarse gravel	32	45	0
very coarse gravel	45	64	0
small cobble	64	90	0
medium cobble	90	128	0
large cobble	128	180	0
very large cobble	180	256	0
small boulder	256	362	0
small boulder	362	512	0
medium boulder	512	1024	0
large boulder	1024	2048	0
very large boulder	2048	4096	0
bedrock			0
Total Particle Count:			100

Note: **RB-3.961**



Size percent less than (mm)				
D16	D35	D50	D84	D95
0.04	0.06	0.08	0.30	0.38

Percent by substrate type					
pan clay	silty-fine sand or sand	gravel	cobble	boulder	bedrock
7%	88%	5%	0%	0%	0%



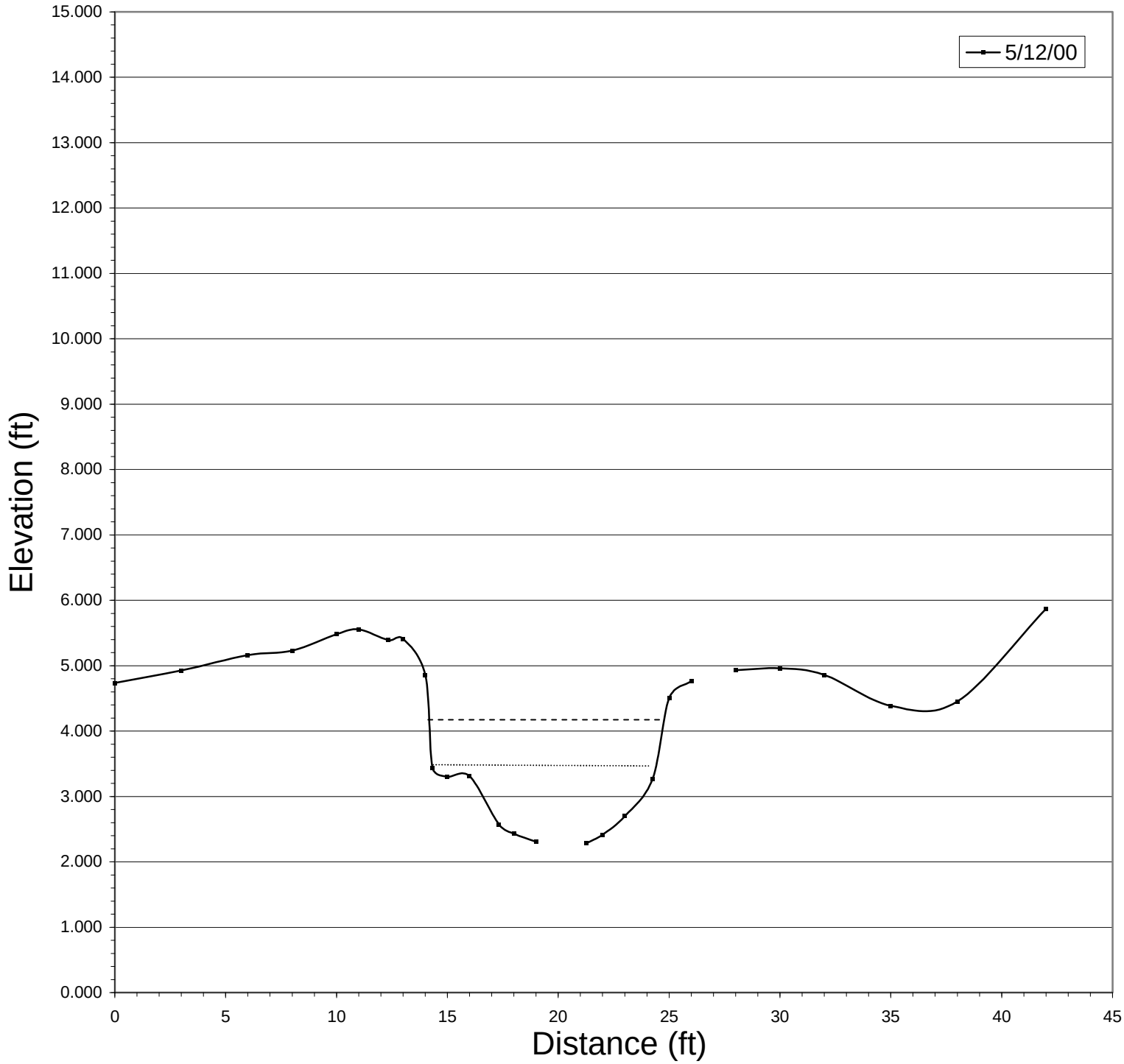
LC-S-0.220

Cross-Section
-Long Creek-
Maine Mall Tributary
Near MVP Sports
~ 100 m up from Q Site

The y- axis scale is 3 times that of the x-axis.

Bankfull Height

Water Level



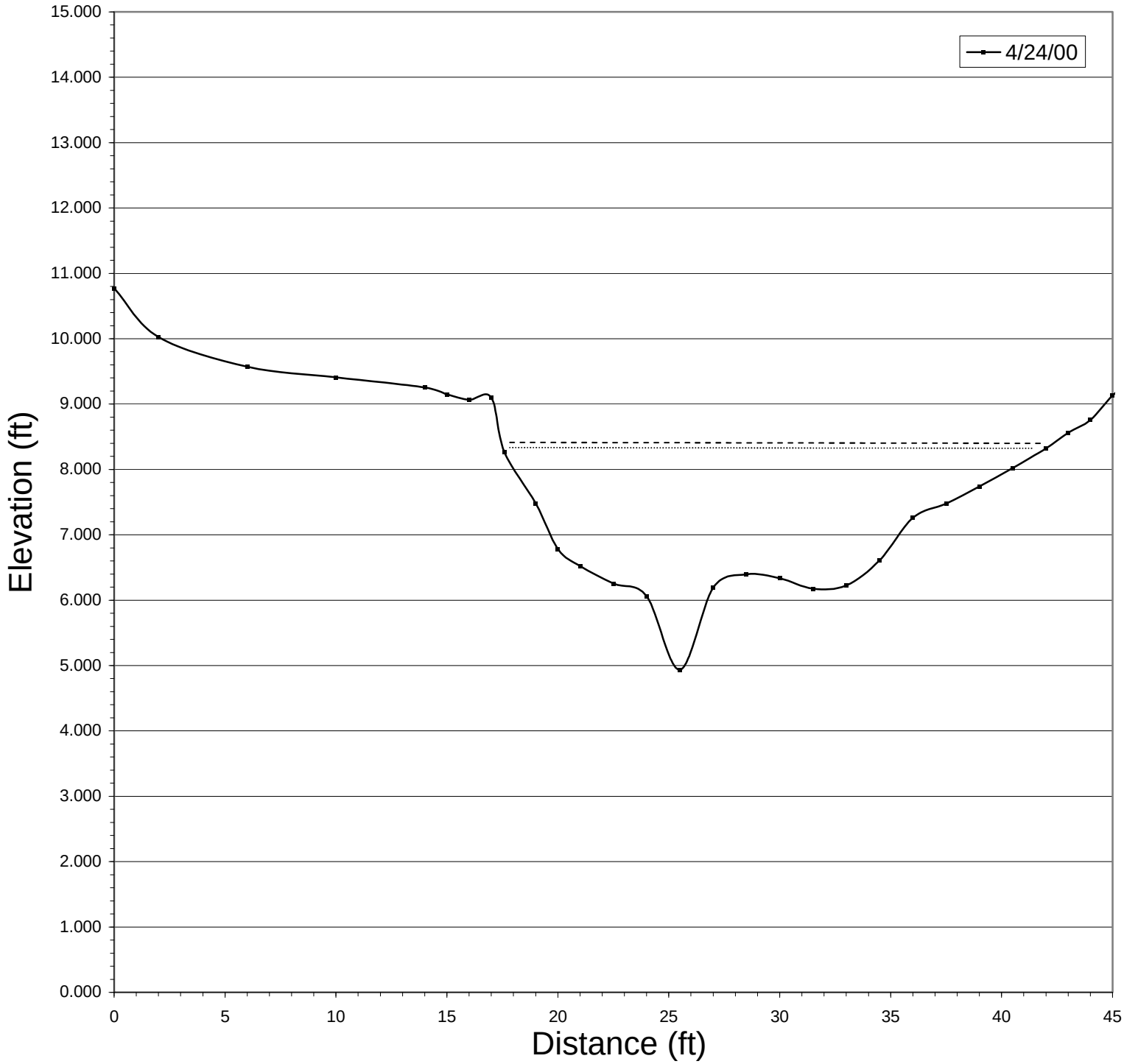
LC-S-0.369

Cross-Section
-Long Creek-
Maine Mall Tributary
At Hoyt's Invert Site

The y- axis scale is 3 times that of the x-axis.

Bankfull Height

Water Level



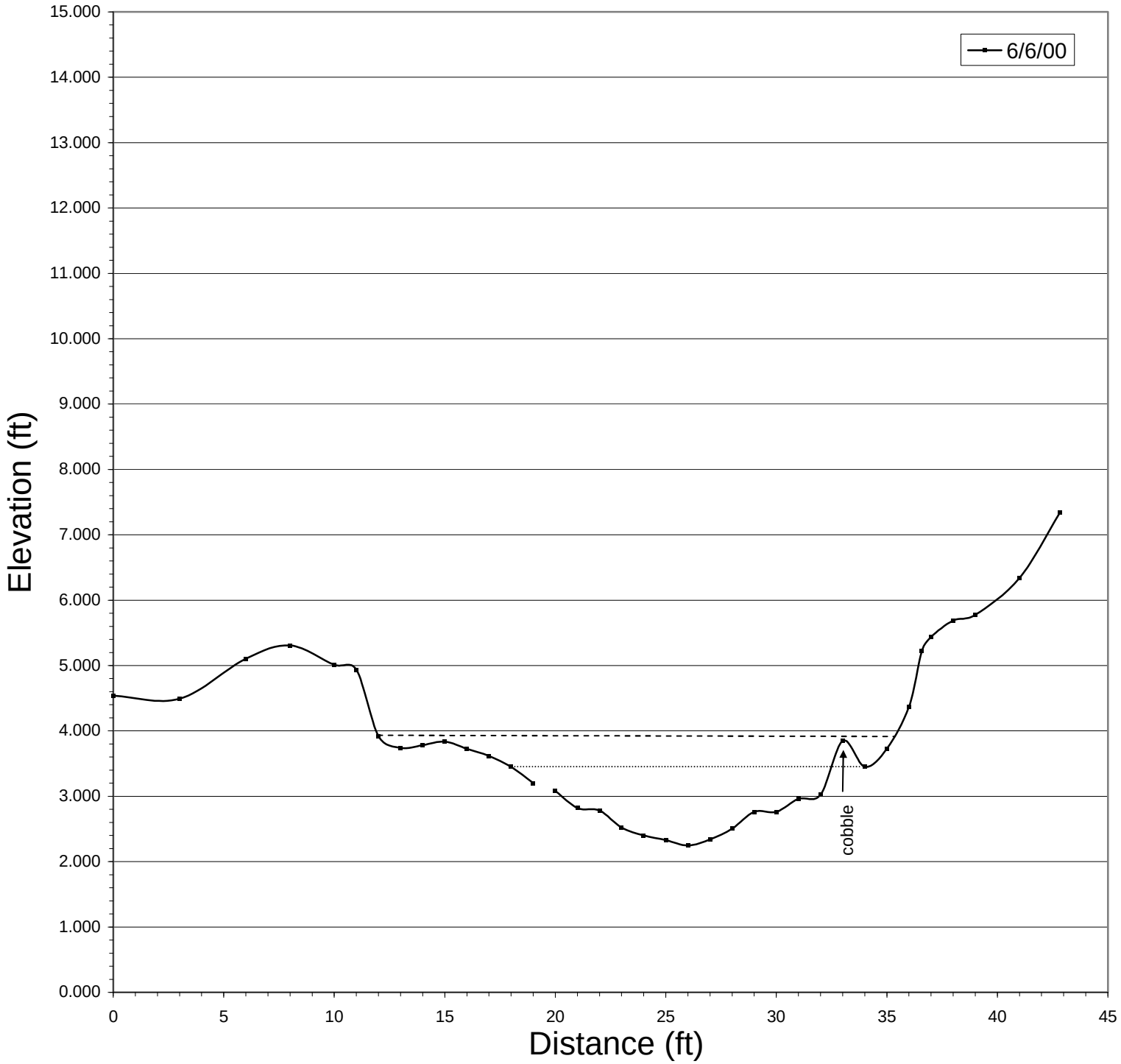
LC-M-0.100~

Cross-Section
-Long Creek-
Main Tributary
Near Gorham Rd.
& Clark's Pond

The y- axis scale is 3 times that of the x-axis.

Bankfull Height

Water Level



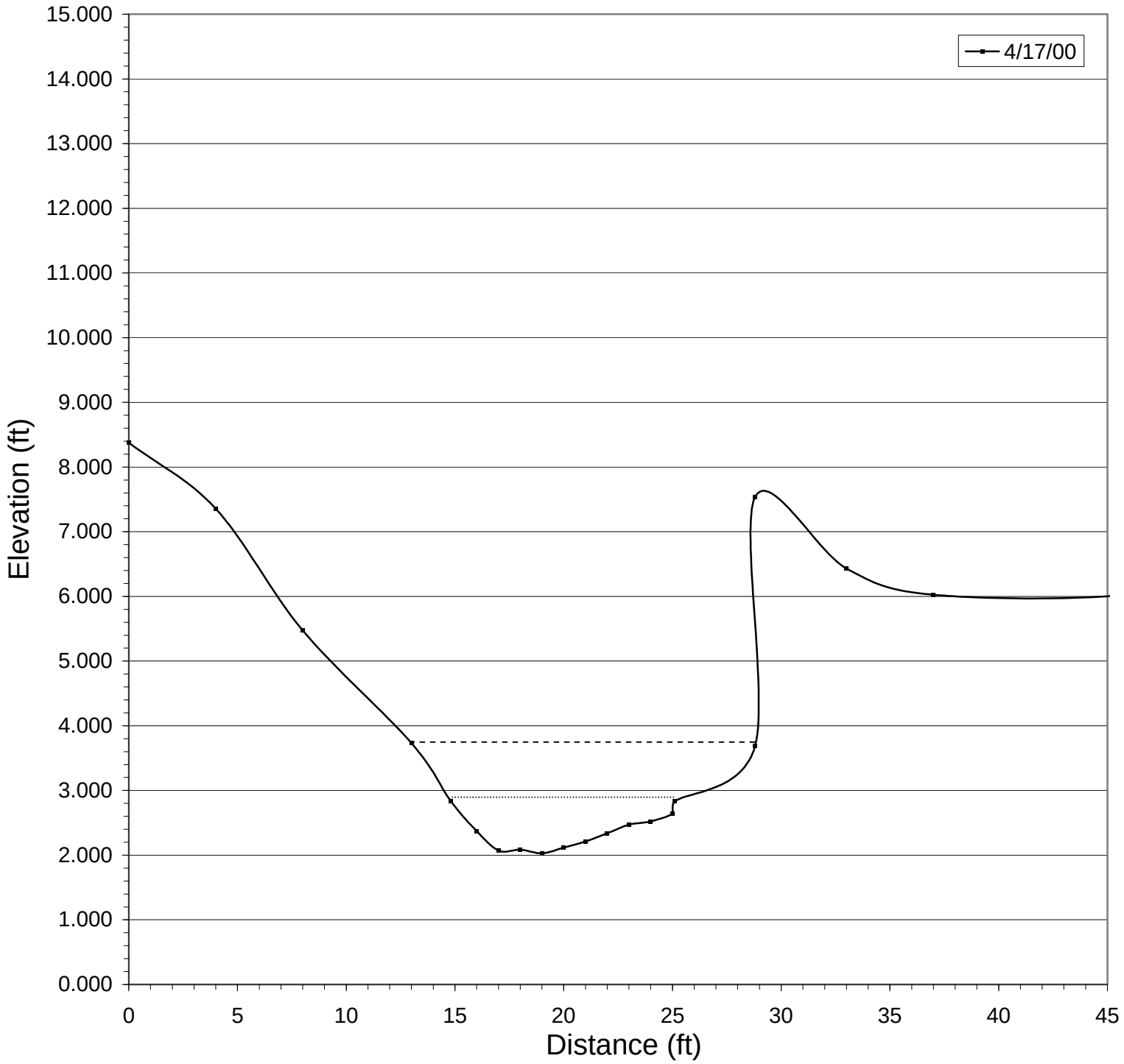
LC-M-0.380

Cross-Section
-Long Creek-
Main Tributary
VTEC-RW

The y- axis scale is 3 times that of the x-axis.

Bankfull Height

Water Level



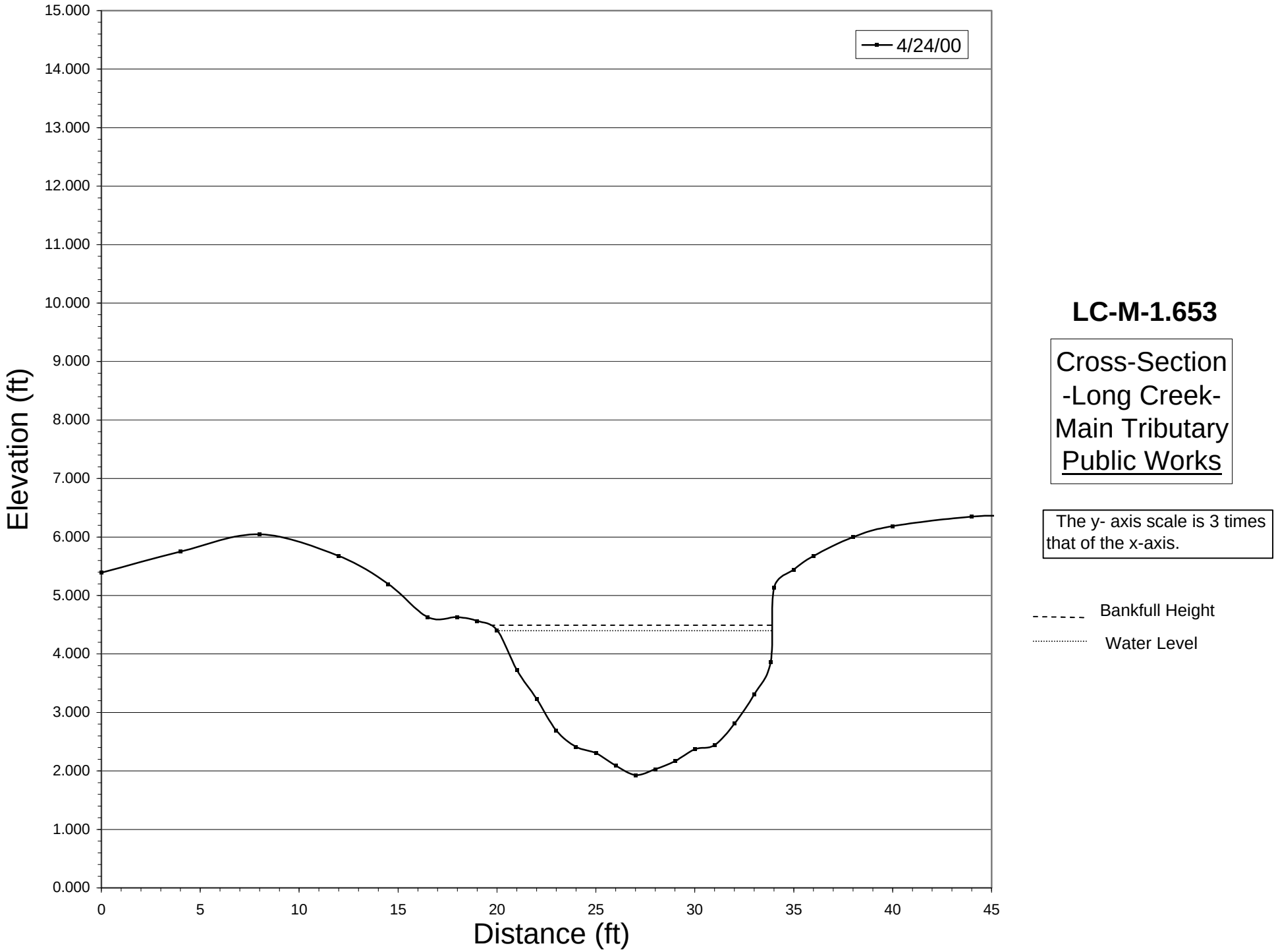
LC-M-0.603

Cross-Section
-Long Creek-
Main Tributary
Above Foden Rd.
Not Q Site

The y- axis scale is 3 times that of the x-axis.

Bankfull Height

Water Level



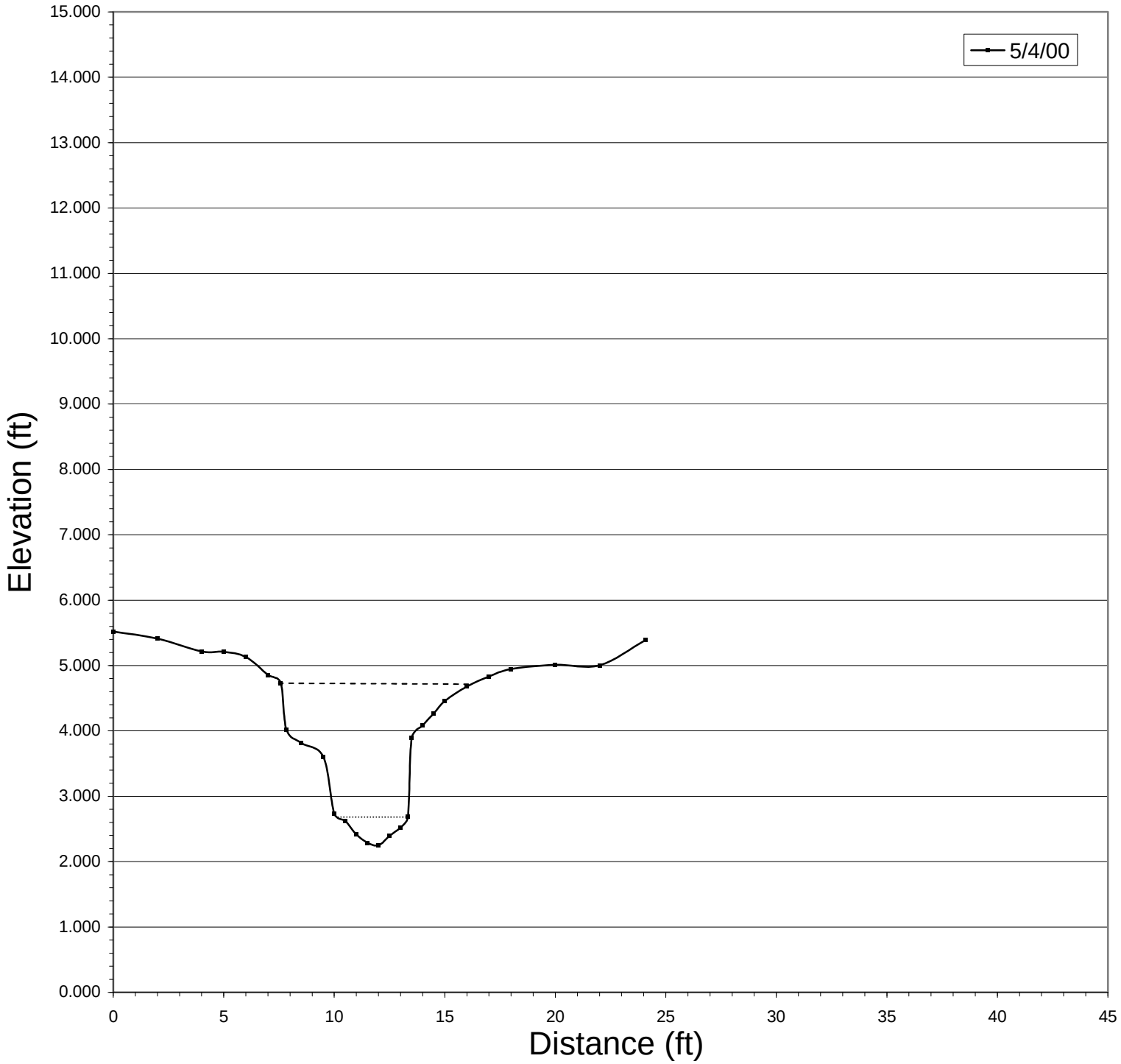
LC-M-1.653

Cross-Section
-Long Creek-
Main Tributary
Public Works

The y- axis scale is 3 times that of the x-axis.

Bankfull Height

Water Level



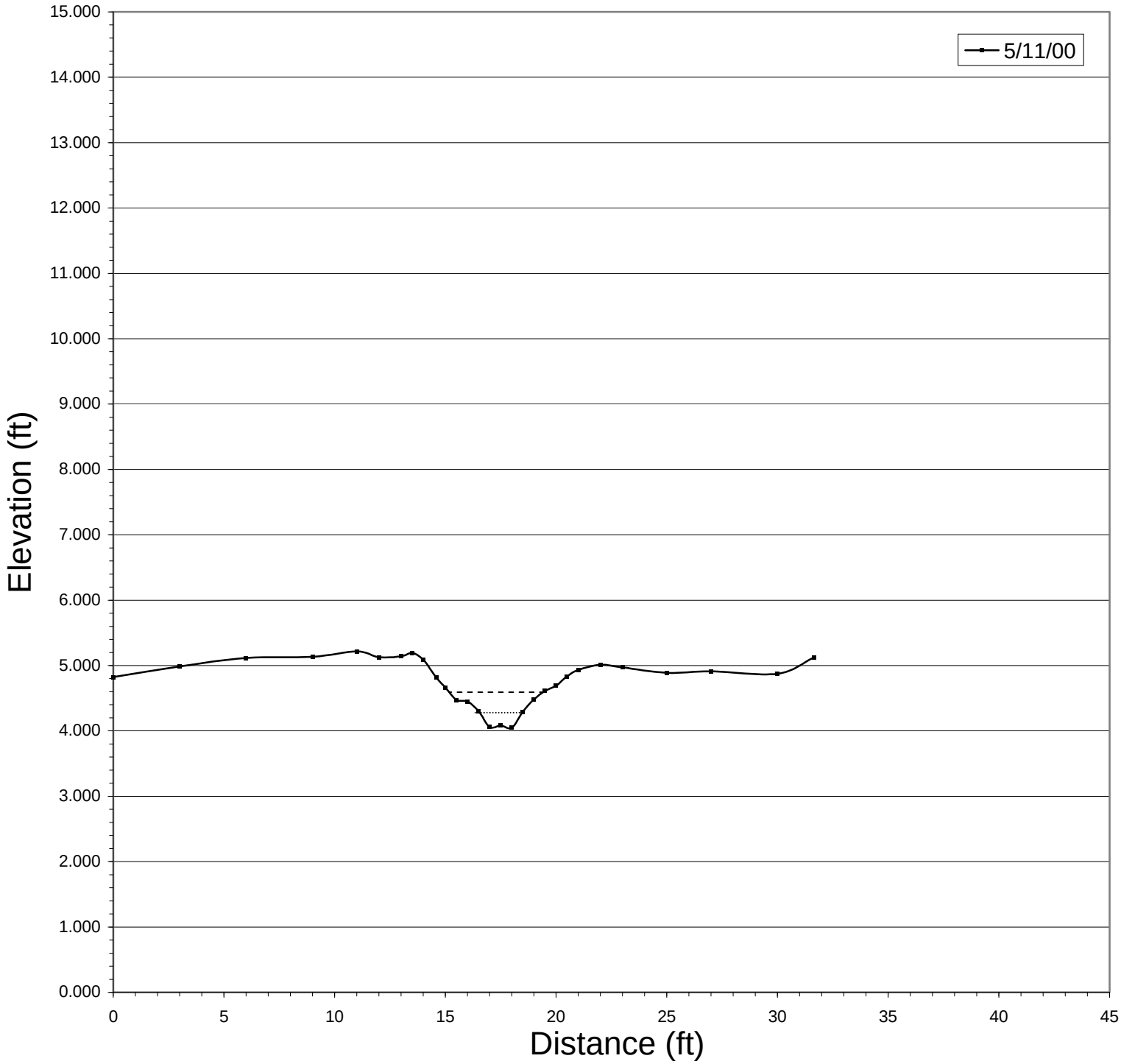
LC-Mn-2.274

Cross-Section
-Long Creek-
Main Tributary
Goodyear

The y- axis scale is 3 times that of the x-axis.

Bankfull Height

Water Level



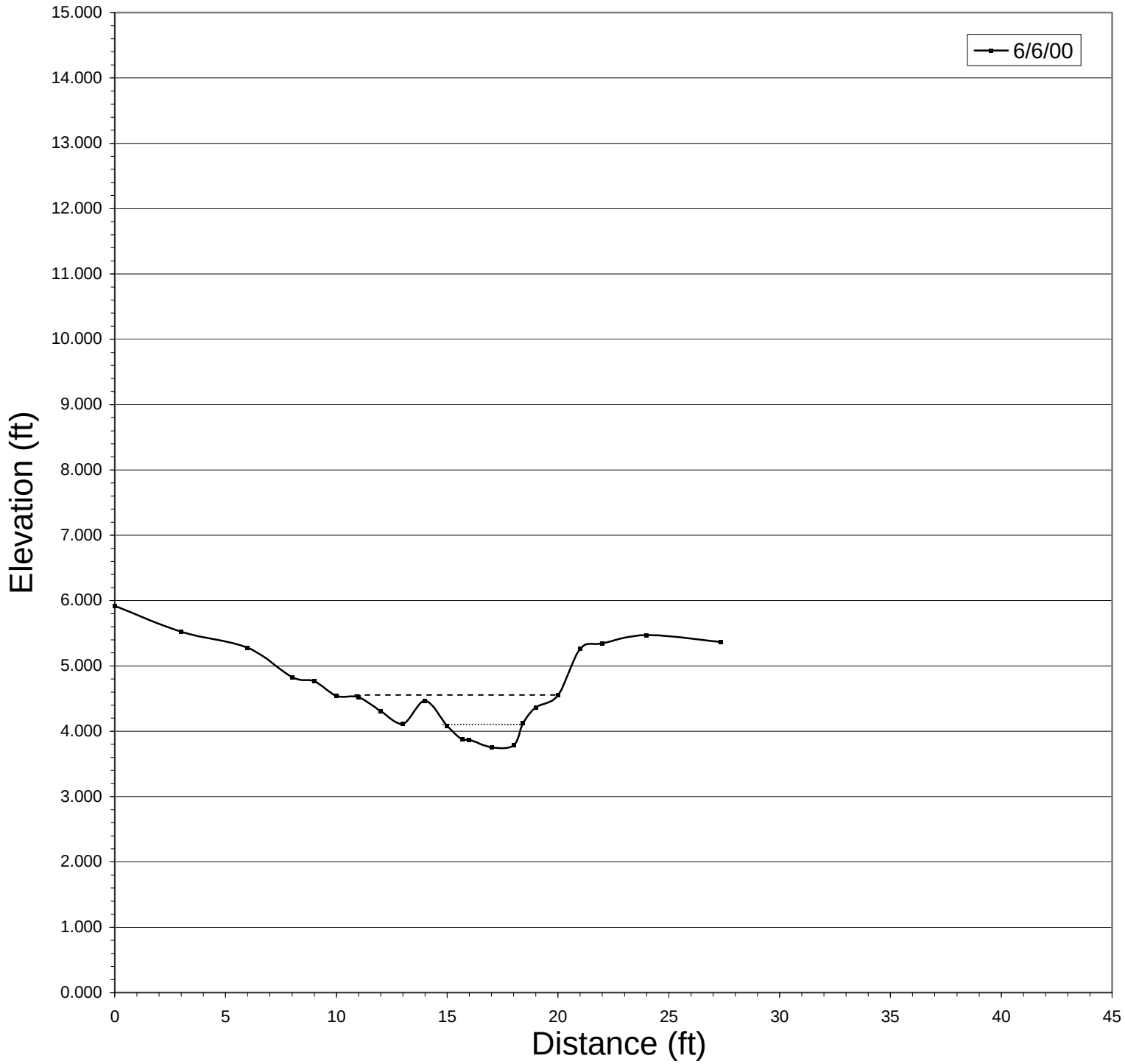
LC-Mw-2.896

Cross-Section
-Long Creek-
Main Tributary
below RWS

The y- axis scale is 3 times that of the x-axis.

Bankfull Height

Water Level



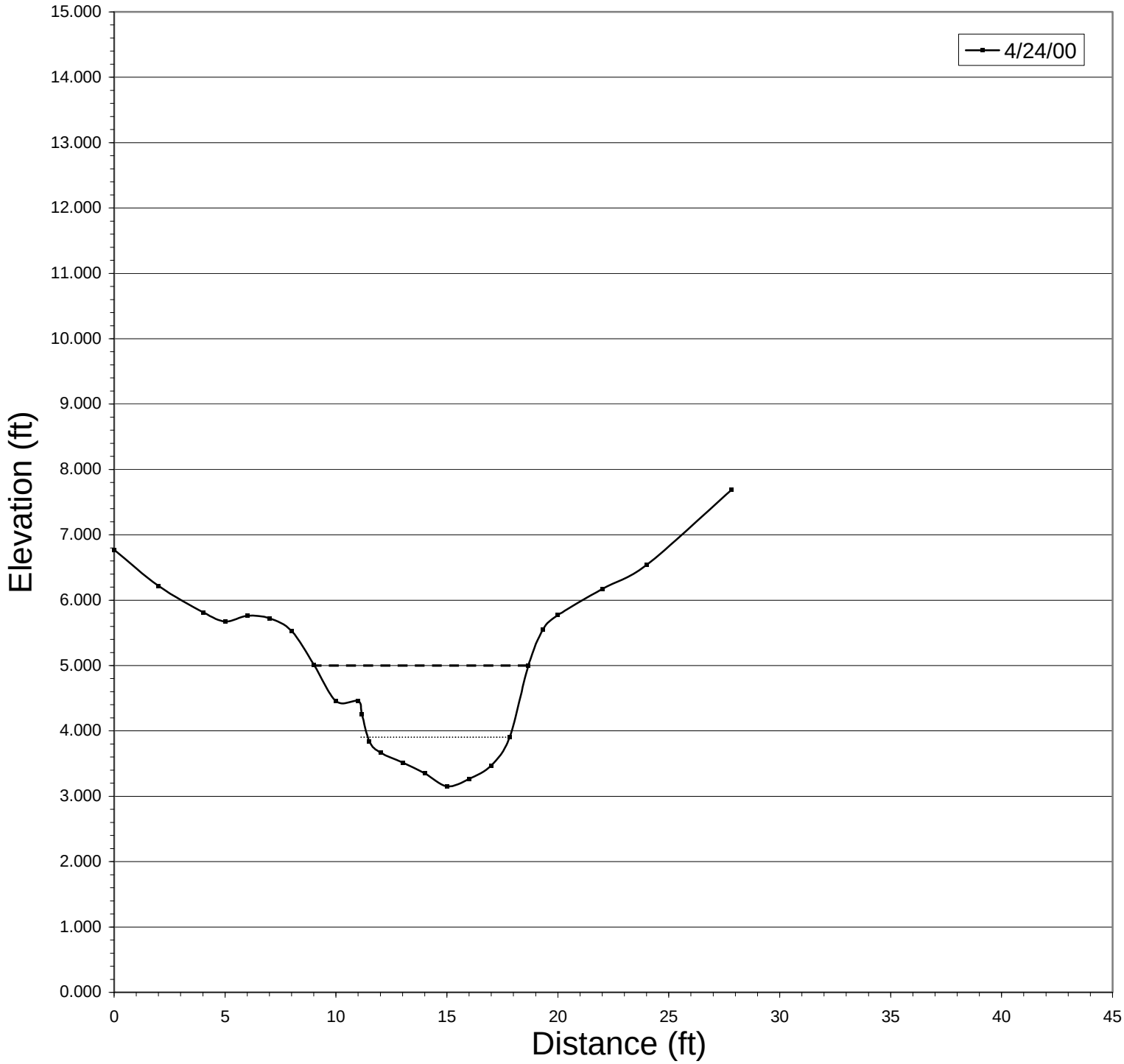
LC-N-0.404

Cross-Section
-Long Creek-
Jetport Tributary
VTEC-LW

The y- axis scale is 3 times that of the x-axis.

Bankfull Height

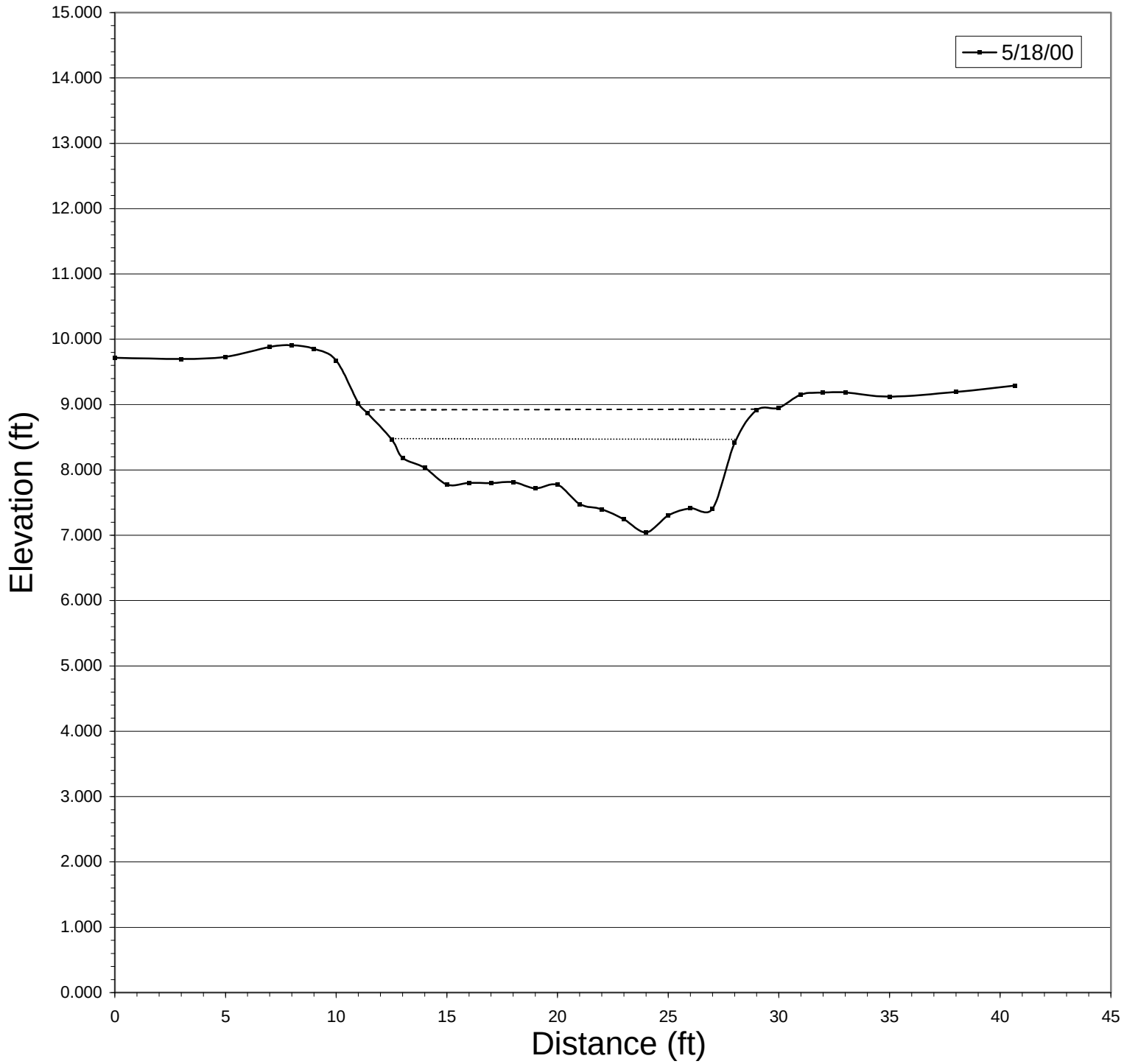
Water Level



LC-N-0.595

Cross-Section
-Long Creek-
Jetport Tributary
Above Foden Rd.

The y- axis scale is 3 times that of the x-axis.



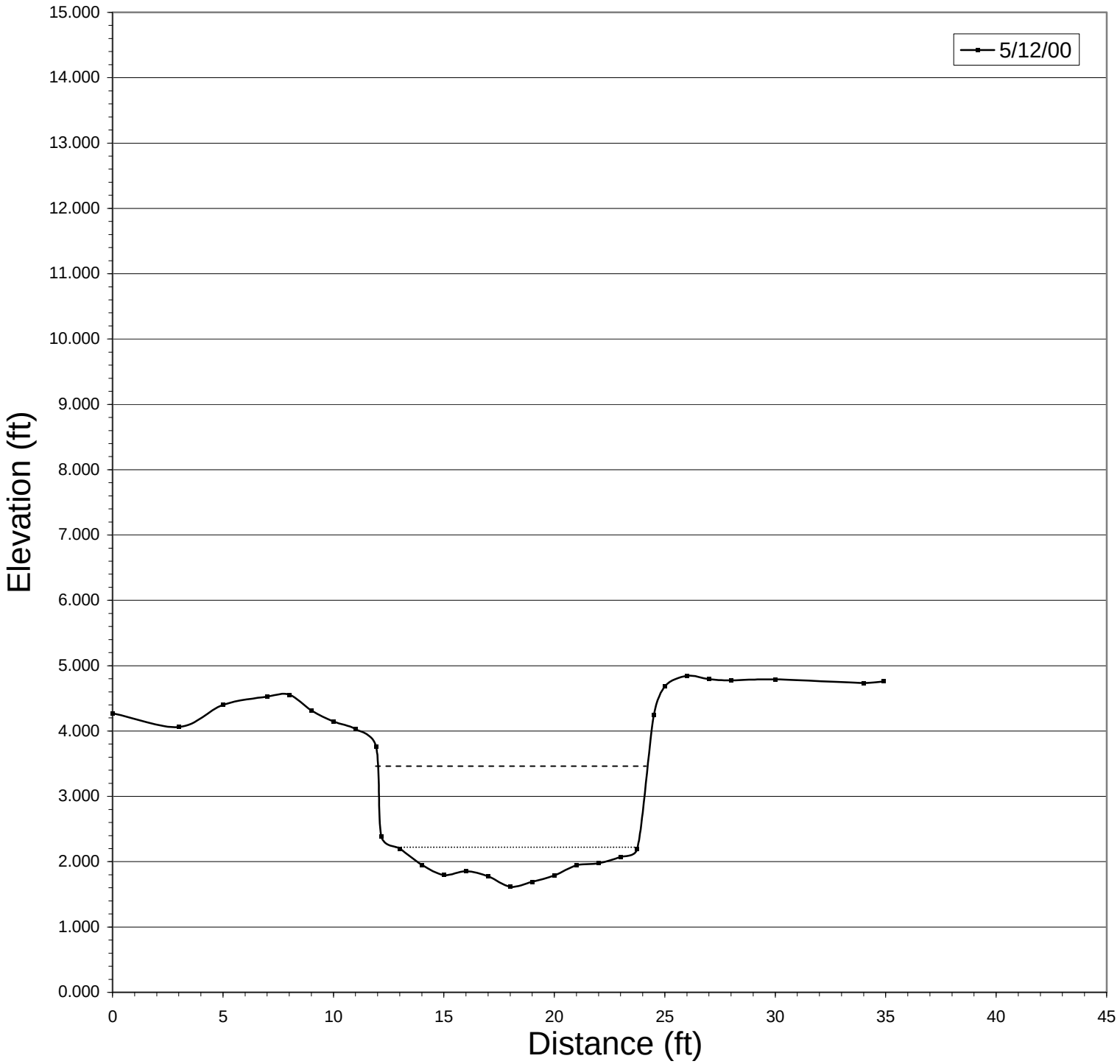
RB-0.071

Cross-Section
-Red Brook-
HQ / HomeDepot

The y- axis scale is 3 times that of the x-axis.

Bankfull Height

Water Level



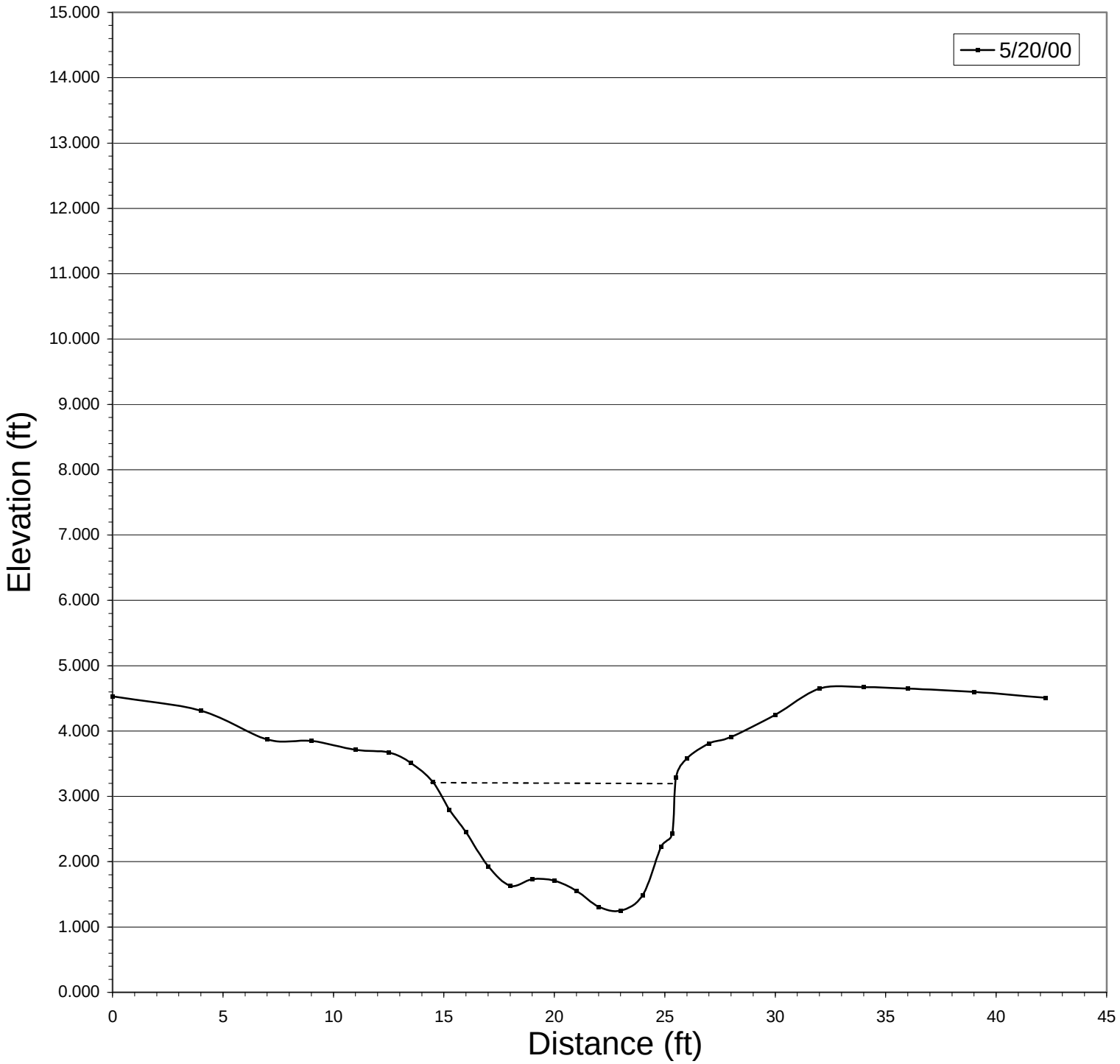
RB-1.434

Cross-Section
-Red Brook-
Lazyboy

The y- axis scale is 3 times that of the x-axis.

Bankfull Height

Water Level



RB-2.119

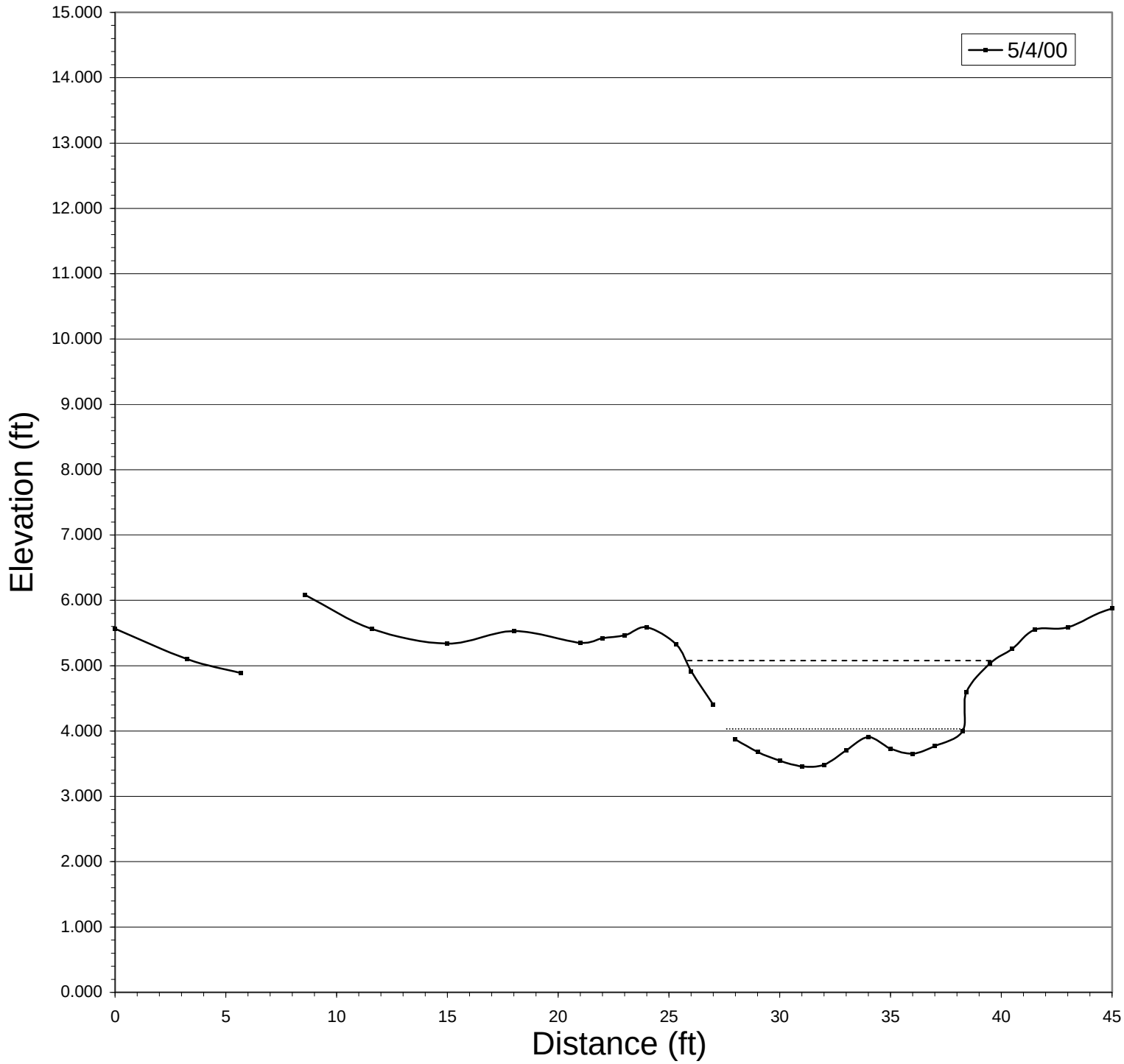
Cross-Section
-Red Brook-
Lion's Club

The y- axis scale is 3 times that of the x-axis.

The water elevation is not available for this site.

Bankfull Height

Water Level



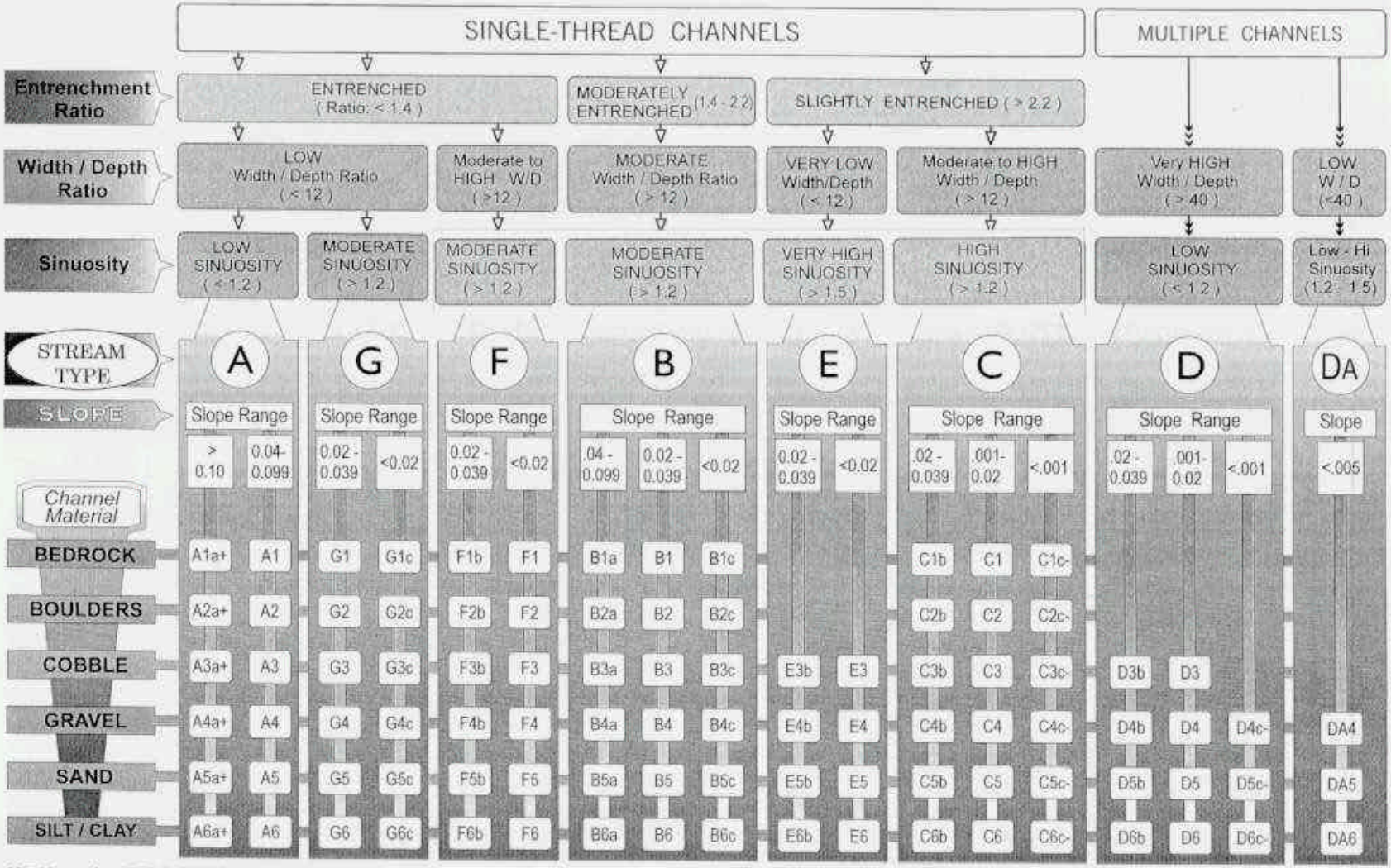
RB-3.961

Cross-Section
-Red Brook-
Above RWS

The y- axis scale is 3 times that of the x-axis.

Bankfull Height

Water Level



KEY to the ROSGEN CLASSIFICATION of NATURAL RIVERS. As a function of the *"continuum of physical variables"* within stream reaches, values of ***Entrenchment*** and ***Sinuosity*** ratios can vary by +/- 0.2 units; while values for ***Width / Depth*** ratios can vary by +/- 2.0 units.

Appendix G-7. Classification key for natural rivers (from Rosgen [1996]).

CHANNEL STABILITY (PFANKUCH) EVALUATION AND STREAM CLASSIFICATION SUMMARY (LEVEL III)

Reach Location_____ Date_____ Observers_____

Stream Type _____

		Category	EXCELLENT	
UPPER BANKS	1	Landform Slope	Bank Slope Gradient <30%	2
	2	Mass Wasting	No evidence of past or future mass wasting.	3
	3	Debris Jam Potential	Essentially absent from immediate channel area.	2
	4	Vegetative Bank Protection	90%+ plant density. Vigor and variety suggest a deep dense soil binding root mass.	3
LOWER BANKS	5	Channel Capacity	Ample for present plus some increases. Peak flows contained. W/D ratio <7.	1
	6	Bank Rock Content	65%+ with large angular boulders. 12"+ common.	2
	7	Obstructions to Flow	Rocks and logs firmly imbedded. Flow pattern without cutting or deposition. Stable bed.	2
	8	Cutting	Little or none. Infreq. raw banks less than 6".	4
	9	Deposition	Little or no enlargement of channel or pt. bars.	4
BOTTOM	10	Rock Angularity	Sharp edges and corners. Plane surfaces rough.	1
	11	Brightness	Surfaces dull, dark or stained. Gen. not bright.	1
	12	Consolidation of Particles	Assorted sizes tightly packed or overlapping.	2
	13	Bottom Size Distribution	No size change evident. Stable mater. 80-100%	4
	14	Scouring and Deposition	<5% of bottom affected by scour or deposition.	6
	15	Aquatic Vegetation	Abundant Growth moss-like, dark green perennial. In swift water too.	1
			TOTAL	

		Category	GOOD	
UPPER BANKS	1	Landform Slope	Bank Slope Gradient 30-40%	4
	2	Mass Wasting	Infrequent. Mostly healed over. Low future potential.	6
	3	Debris Jam Potential	Present, but mostly small twigs and limbs.	4
	4	Vegetative Bank Protection	70-90% density. Fewer species or less vigor suggest less dense or deep root mass.	6
LOWER BANKS	5	Channel Capacity	Adequate. Bank overflows rare. W/D ratio 8-15	2
	6	Bank Rock Content	40-65%. Mostly small boulders to cobbles 6-12"	4
	7	Obstructions to Flow	Some present causing erosive cross currents and minor pool. filling. Obstructions newer and less firm.	4
	8	Cutting	Some, intermittently at outcurves and constrictions. Raw banks may be up to 12"	6
	9	Deposition	Some new bar increase, mostly from coarse gravel.	8
BOTTOM	10	Rock Angularity	Rounded corners and edges, surfaces smooth, flat.	2
	11	Brightness	Mostly dull, but may have <35% bright surfaces.	2
	12	Consolidation of Particles	Moderately packed with some overlapping.	4
	13	Bottom Size Distribution	Distribution shift light. Stable material 50-80%.	8
	14	Scouring and Deposition	5-30% affected. Scour at constrictions and where grades steepen. Some deposition in pools.	12
	15	Aquatic Vegetation	Common. Algae forms in low velocity and pool areas. Moss here too.	2
			TOTAL	

		Category	FAIR	
UPPER BANKS	1	Landform Slope	Bank slope gradient 40-60%	6
	2	Mass Wasting	Frequent or large, causing sediment nearly year long.	9
	3	Debris Jam Potential	Moderate to heavy amounts, mostly larger sizes.	6
	4	Vegetative Bank Protection	<50-70% density. Lower vigor and fewer species from a shallow, discontinuous root mass.	9
LOWER BANKS	5	Channel Capacity	Barely contains present peaks. Occasional overbank floods. W/D ratio 15 to 25.	3
	6	Bank Rock Content	20-40% with most in the 3-6" diameter class.	6
	7	Obstructions to Flow	Moder. frequent, unstable obstructions move with high flows causing bank cutting and pool filling.	6
	8	Cutting	Significant. Cuts 12-24" high. Root mat overhangs and sloughing evident	12
	9	Deposition	Moder. deposition of new gravel and course sand on old and some new bars.	12
BOTTOM	10	Rock Angularity	Corners and edges well rounded in two dimensions.	3
	11	Brightness	Mixture dull and bright, ie 35-65% mixture range.	3
	12	Consolidation of Particles	Mostly loose assortment with no apparent overlap.	6
	13	Bottom Size Distribution	Moder. change in sizes. Stable materials 20-50%	12
	14	Scouring and Deposition	30-50% affected. Deposits & scour at obstructions, constrictions, and bends. Some filling of pools.	18
	15	Aquatic Vegetation	Present but spotty, mostly in backwater. Seasonal algae growth makes rocks slick.	3
			TOTAL	

Appendix G-8. Channel stability evaluation *(Pfankuch, 1975)* with a conversion of the channel stability rating to a reach condition by stream type.

From Rosgen (1996).

CHANNEL STABILITY (PFANKUCH) EVALUATION AND STREAM CLASSIFICATION SUMMARY (LEVEL III)

	Category	POOR	
UPPER BANKS	1 Landform Slope	Bank Slope Gradient 60%+	8
	2 Mass Wasting	Frequent or large causing sediment nearly year long or imminent danger of same.	12
	3 Debris Jam Potential	Moder. to heavy amounts, predom. larger sizes.	8
	4 Vegetative Bank Protection	<50% density, fewer species and less vigor indicate poor, discontinuous and shallow root mass.	12
LOWER BANKS	5 Channel Capacity	Inadequate. Overbank flows common. W/D ratio >25	4
	6 Bank Rock Content	<20% rock fragments of gravel sizes, 1-3" or less.	8
	7 Obstructions to Flow	Sediment traps full, channel migration occurring.	
	8 Cutting	Almost continuous cuts, some over 24" high. Failure of overhangs frequent.	16
	9 Deposition	Extensive deposits of predom. fine particles. Accelerated bar development.	16
BOTTOM	10 Rock Angularity	Well rounded in all dimensions, surfaces smooth.	4
	11 Brightness	Predom. bright, 65%+ exposed or scoured surfaces.	4
	12 Consolidation of Particles	No packing evident. Loose assortment easily moved.	8
	13 Bottom Size Distribution	Marked distribution change. Stable materials 0-20%.	16
	14 Scouring and Deposition	More than 50% of the bottom in a state of flux or change nearly year long.	24
	15 Aquatic Vegetation	Perennial types scarce or absent. Yellow-green, short term bloom may be present.	4
		TOTAL	

Stream Width _____ x avg. depth _____ x mean velocity _____ = Q _____ cfs

Gauge Ht _____ Reach Gradient _____ Stream Order _____ Sinuosity Ratio _____

Width $_{BF}$ _____ Depth $_{BF}$ _____ W/D Ratio _____ Discharge (Q_{BF}) _____

Drainage Area _____ Valley Gradient _____ Stream Length _____ Valley Length _____

Sinuosity _____ Entrenchment Ratio _____ Length Meander (Lm) _____ Belt Width _____

Sediment Supply
Extreme _____
Very High _____
High _____
Moderate _____
Low _____

Stream Bed Stability
Aggrading _____
Degrading _____
Stable _____

Width/Depth Ratio Condition
Normal _____
High _____
Very High _____

TOTAL SCORE for Reach E____ = G____ + F____ + P____ = ____ Stream Type

____ Pfankuch Rating

Remarks _____ from table ____ Reach Condition

CONVERSION OF STABILITY RATING TO REACH CONDITION BY STREAM TYPE*

Stream Type	A1	A2	A3	A4	A5	A6	B1	B2	B3	B4	B5	B6
GOOD	38-43	38-43	54-90	60-95	60-95	50-80	38-45	38-45	40-60	40-64	48-68	40-60
FAIR	44-47	44-47	91-129	96-132	96-142	81-110	46-58	46-58	61-78	65-84	69-88	61-78
POOR	48+	48+	130+	133+	143+	111+	59+	59+	79+	85+	89+	79+

Stream Type	C1	C2	C3	C4	C5	C6	D3	D4	D5	D6
GOOD	38-50	38-50	60-85	70-90	70-90	60-85	85-107	85-107	85-107	67-98
FAIR	51-61	51-61	86-105	91-110	91-110	86-105	108-132	108-132	108-132	99-125
POOR	62+	62+	106+	111+	111+	106+	133+	133+	133+	126+

Stream Type	DA3	DA4	DA5	DA6	E3	E4	E5	E6
GOOD	40-63	40-63	40-63	40-63	40-63	50-75	50-75	40-63
FAIR	64-86	64-86	64-86	64-86	64-86	76-96	76-96	64-86
POOR	87+	87+	87+	87+	87+	97+	97+	87+

Stream Type	F1	F2	F3	F4	F5	F6	G1	G2	G3	G4	G5	G6
GOOD	60-85	60-85	85-110	85-110	90-115	80-95	40-60	40-60	85-107	85-107	90-112	85-107
FAIR	86-105	86-105	111-125	111-125	116-130	96-110	61-78	61-78	108-120	108-120	113-125	108-120
POOR	106+	106+	126+	126+	131+	111+	79+	79+	121+	121+	126+	121+

**Generalized relations ... need additional Level IV data to expand data base for validation.*

Appendix G-9. Channel stability evaluation ... (continued)

From Rosgen (1996).

Stream type	Sensitivity to disturbance[a]	Recovery potential[b]	Sediment supply[c]	Streambank erosion potential	Vegetation controlling influence[d]
A1	very low	excellent	very low	very low	negligible
A2	very low	excellent	very low	very low	negligible
A3	very high	very poor	very high	very high	negligible
A4	extreme	very poor	very high	very high	negligible
A5	extreme	very poor	very high	very high	negligible
A6	high	poor	high	high	negligible
B1	very low	excellent	very low	very low	negligible
B2	very low	excellent	very low	very low	negligible
B3	low	excellent	low	low	moderate
B4	moderate	excellent	moderate	low	moderate
B5	moderate	excellent	moderate	moderate	moderate
B6	moderate	excellent	moderate	low	moderate
C1	low	very good	very low	low	moderate
C2	low	very good	low	low	moderate
C3	moderate	good	moderate	moderate	very high
C4	very high	good	high	very high	very high
C5	very high	fair	very high	very high	very high
C6	very high	good	high	high	very high
D3	very high	poor	very high	very high	moderate
D4	very high	poor	very high	very high	moderate
D5	very high	poor	very high	very high	moderate
D6	high	poor	high	high	moderate
Da4	moderate	good	very low	low	very high
DA5	moderate	good	low	low	very high
DA6	moderate	good	very low	very low	very high
E3	high	good	low	moderate	very high
E4	very high	good	moderate	high	very high
E5	very high	good	moderate	high	very high
E6	very high	good	low	moderate	very high
F1	low	fair	low	moderate	low
F2	low	fair	moderate	moderate	low
F3	moderate	poor	very high	very high	moderate
F4	extreme	poor	very high	very high	moderate
F5	very high	poor	very high	very high	moderate
F6	very high	fair	high	very high	moderate
G1	low	good	low	low	low
G2	moderate	fair	moderate	moderate	low
G3	very high	poor	very high	very high	high
G4	extreme	very poor	very high	very high	high
G5	extreme	very poor	very high	very high	high
G6	very high	poor	high	high	high

a Includes increases in streamflow magnitude and timing and/or sediment increases.

b Assumes natural recovery once cause of instability is corrected.

c Includes suspended and bedload from channel derived sources and/or from stream adjacent slopes.

d Vegetation that influences width/depth ratio-stability.

Appendix G-10. Management interpretations of various stream types (*Rosgen, 1994*)

From Rosgen (1996).

APPENDIX H

Water Quality Classification Standards

Information about Maine's water quality classification system can be found online at:
< www.state.me.us/dep/blwq/monitoring.htm >.

For information related to statutory water quality classification of various Maine waterbodies, visit < http://www.maine.gov/dep/blwq/monitoring.htm >.

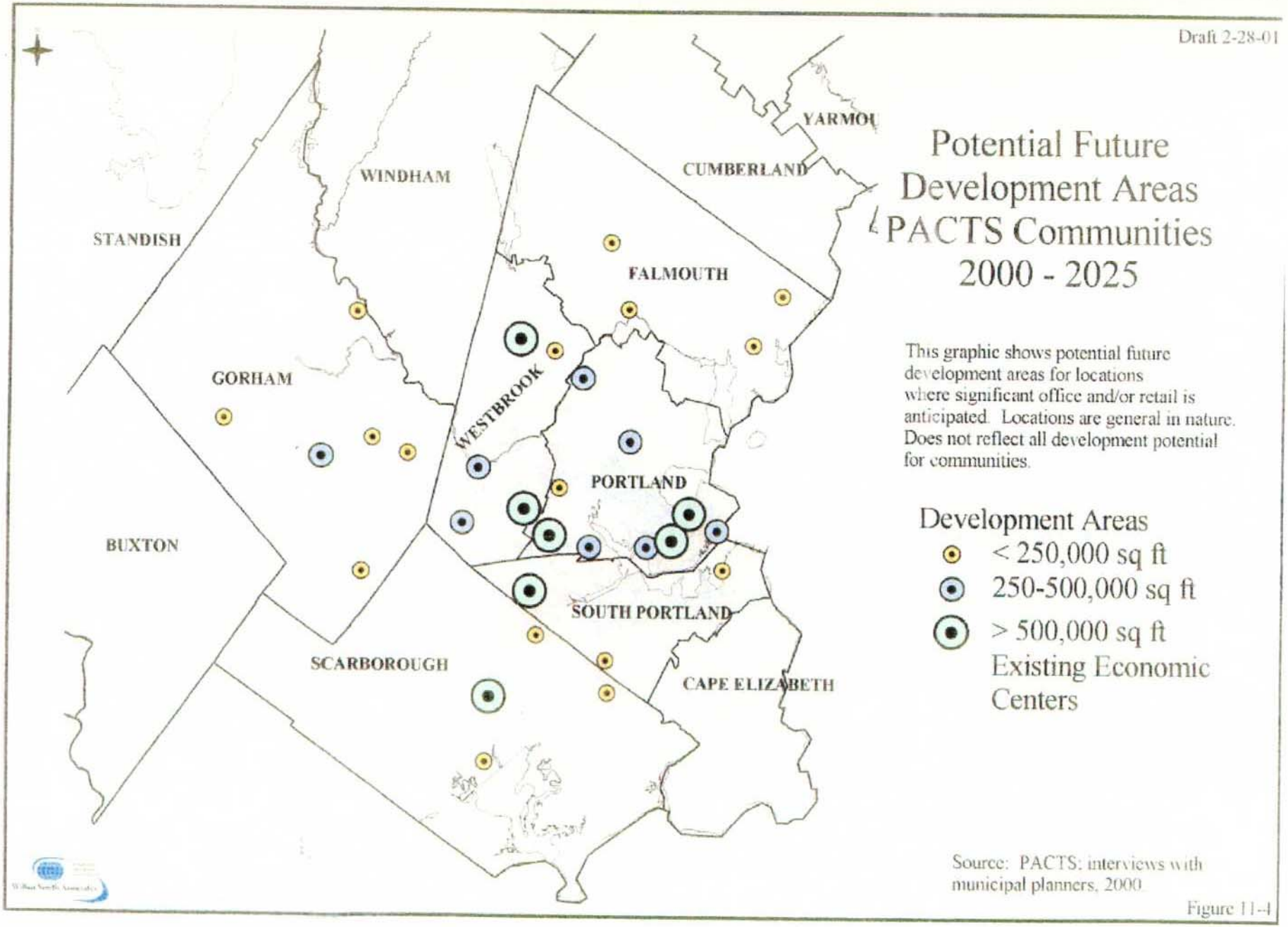
APPENDIX I

Growth Projections

Population Forecasts

Community	1990	Population 2020	Pop Change 1990-2020
Brunswick	20,906	23,987	3,081
Portland	64,157	65,561	1,404
S. Portland	23,163	24,318	1,155
Westbrook	16,121	18,907	2,786
Urban Communities	**124,347**	**132,773**	8,426
Cape Elizabeth	8,854	10,472	1,618
Cumberland	5,836	8,787	2,951
Falmouth	7,610	11,420	3,810
Freeport	6,905	9,401	2,496
Gorham	11,856	16,879	5,023
Gray	5,904	9,149	3,245
Scarborough	12,518	19,582	7,064
Standish	7,678	11,509	3,831
Windham	13,020	18,086	5,066
Yarmouth	7,862	9,951	2,089
Suburban Communities	**88,043**	**125,235**	37,192
Baldwin	1,219	1,538	319
Bridgton	4,307	6,321	2,014
Casco	3,018	4,404	1,386
Harpswell	5,012	6,118	1,106
Harrison	1,951	2,966	1,015
Naples	2,860	4,694	1,834
New Gloucester	3,916	6,134	2,218
N. Yarmouth	2,429	4,297	1,868
Pownal	1,262	1,412	150
Raymond	3,311	5,210	1,899
Sebago	1,259	1,587	328
Long Island	201	199	(2)
Rural Communities	**30,745**	**44,879**	14,134
Total Cumberland County	**243,135**	**302,887**	59,752

Source: GPCOG based on REMI Econometric Forecast
Forecast prepared in 1998



Note (5/19/06): Figure source is PACTS (Portland Area Comprehensive Transportation Committee) . (Their website is http://pactsplan.org/ .)

APPENDIX J

Quality Assurance / Quality Control
Information

Quality Assurance / Quality Control Information

Note: The protocols, including quality assurance and quality control measures used in this study, are described in the methods section (Chapter 2) of this report. Where additional information needs to be presented, including the locations of QA/QC data and notes about observers of various techniques (to ensure that data/samples were collected properly) used in this study, are either discussed in the results section or listed below.

2.1 Land Use Analysis, Stream Walk, Watershed Survey, and Surficial Geology Investigation

GIS

In a few cases, reach length at a site was collected using a GPS unit in order to save time. In order to gain an estimate of comparability of field- and GIS-gathered information, I measured endpoints of the reach at a study site (LC-M-2.896) (upstream and downstream points) using both a tape measure and also with a GPS unit (Trimble model # TDC1). The results were: 201.5' (tape) vs. 207.7' (GPS), with a difference of 6.2', so the GPS was determined to underestimate linear distance by 3.1% at this site. This information also is useful when estimating the accuracy of sampling site GPS points.

2.2 Biological Community Sampling

Macroinvertebrates

Observers/helpers during standard Maine DEP "rockbag" macroinvertebrate sampling:

- Mary-Ellen Dennis, Maine DEP, Division of Watershed Management, Augusta
- Don Kale, Maine DEP, Division of Watershed Management, Portland

Fish

Observers/helpers during fish sampling:
- John Reynolds, Maine DEP, Division of Environmental Assessment (fish biologist), Augusta

2.3 Water Chemistry and Suspended Solids (Baseflow and Stormflow) Sampling

QA/QC data may be found in the tables in Appendix C or in the appropriate tables in the results section (Chapter 3.3).
Observer of one sampling event:
- Don Kale, Maine DEP, Division of Watershed Management, Portland

QA for sample containers:
- All sample containers (field samples, blanks, etc.) were taken from the same batch
- cubitainer batch: 10/22/99 shift 2
- 250-ml containers for nutrient and TSS samples: lot # 355474
- oil and grease bottles were pre-cleaned and certified by ESF

2.4 Water Temperature Monitoring

See Appendix D.

2.5 Hydrology Data Collection

See pre-storm photos of culverts below the flow measurement stations at the end of Appendix L. Surveys (using a surveyor's level and rod) of the ISCO flow meter bubble-line attachment sites, as well as cross-section surveys of the measurement locations, are entered into spreadsheets but have not yet been worked up into figures and tables. For calibration (stage-discharge relationship) data

for the ISCO flow meters, see Appendix E. Occasional technical problems with the ISCO data loggers sometimes limited the number of readings that could be gathered for the calibrations.

Observer of a manually-measured discharge sampling event:

- Don Kale, Maine DEP, Division of Watershed Management, Portland

2.7 Fluvial Geomorphology Assessment

Observers of channel cross-section, gradient, and various Rosgen classification field measurements:

- Jeff Dennis, Maine Department of Environmental Protection, Biologist, Division of Watershed Management, Augusta
- Don Kale, Maine Department of Environmental Protection, Division of Watershed Management, Portland

APPENDIX K

Glossaries

GLOSSARY

Modified from:

- U. S. Environmental Protection Agency. 1997. Volunteer Stream Monitoring: A Methods Manual. EPA 841-B-97-003. Office of Water. < http://www.epa.gov/volunteer/stream/ >
- Fischenich, C. 2000. Glossary of Stream Restoration Terms. EMRRP-SR-01. Prepared for the U. S. Army Corps of Engineers' Ecosystem Management and Restoration Program. < http://www.wes.army.mil/el/emrrp/tnotes.html > (Only a few terms were taken from this document. See the actual document for more terms.)
- A "JV" indicates that the entry was written by the author of this report.

accuracy - a measure of how close repeated trials are to the desired target.

acidity - a measure of the number of free hydrogen ions (H+) in a solution that can chemically react with other substances.

alkalinity - a measure of the negative ions that are available to react and neutralize free hydrogen ions. Some of most common of these include hydroxide (OH), sulfate (SO4), phosphate (PO4), bicarbonate (HCO3) and carbonate (CO3)

ambient - pertaining to the current environmental condition.

assemblage - the set of related organisms that represent a portion of a biological community (e.g., benthic macroinvertebrates).

bankfull discharge - the stream discharge corresponding to the water stage that first overtops the natural banks. This flow occurs, on average, about once every 1 to 2 years.

benthic - pertaining to the bottom (bed) of a water body.

biochemical oxygen demand (BOD) - the amount of oxygen consumed by microorganisms as they decompose organic materials in water.

biological criteria - numerical values or narrative descriptions that depict the biological integrity of aquatic communities in that state. May be listed in state water quality standards.

buret - a graduated glass tube used for measuring and releasing small and precise amounts of liquid.

catchment - (1) The catching or collecting of water, especially rainfall; (2) a reservoir or other basin for catching water; (3) the water thus caught; (4) a watershed.

channel - the section of the stream that contains the main flow.

channelization - the straightening of a stream; this often is a result of human activity.

chemical constituents - chemical components that are part of a whole.

cobble - medium-sized rocks (210 inches) that are found in a stream bed.

combined sewer overflow (CSO) - sewer systems in which sanitary waste and stormwater are combined in heavy rains; this is especially common in older cities. The discharge from CSOs is typically untreated.

community - the whole of the plant and animal population inhabiting a given area.

culvert - man-made construction that diverts the natural flow of water.

d-frame net - a fine mesh net that is attached to a pole and used for sampling. It resembles a butterfly net.

deionized water - water that has had all of the ions (atoms or molecules) other than hydrogen and oxygen removed.

designated uses - state-established desirable uses that waters should support, such as fishing, swimming, and aquatic life. Listed in state water quality standards.

dissolved oxygen (DO) - oxygen dissolved in water and available for living organisms to use for respiration.

distilled water - water that has had most of its impurities removed.

drainage density - the area of drainage channels facilitating precipitation reaching a waterbody such as a stream; equals stream length/catchment area (JV).

dredge - to remove sediments from the stream bed to deepen or widen the channel.

drift - when stream macroinvertebrates are exposed to a disturbance, they sometimes react by allowing themselves to be passively transported downstream in the water column (JV).

ecoregion - geographic areas that are distinguished from others by ecological characteristics such as climate, soils, geology, and vegetation.

effluent - wastewater discharge.

embeddedness - the degree to which rocks in the streambed are surrounded by sediment.

emergent plants - plants rooted underwater, but with their tops extending above the water.

Erlenmeyer flask - a flask having a wide bottom and a smaller neck and mouth that is used to mix liquids.

eutrophication - the natural and artificial addition of nutrients to a waterbody, which may lead to greatly increased algae production and eventual decay, which then may result in depleted oxygen concentrations. Eutrophication is a natural process that is frequently accelerated and intensified by human activities. (JV)

floating plants - plants that grow free floating, rather than being attached to the stream bed.

flocculent (floc) - a mass of particles that form into a clump as a result of a chemical reaction.

glide/run - section of a stream with a relatively high velocity and with little or no turbulence on the surface of the water.

graduated cylinder - a cylinder used to measure liquids that is marked in units.

gross morphological features - large obvious identifying physical characteristics of an organism.

headwaters - the origins of a stream.

hyporheic zone - the area under the stream channel and floodplain where groundwater and the surface waters of the stream are exchanged freely.

hypoxia - depletion of dissolved oxygen in an aquatic system.

impairment - degradation.

impervious surface - a surface which is impermeable and which does not allow precipitation to infiltrate into the ground; examples include roads, parking lots, sidewalks, and rooftops.

impoundment - a body of water contained by a barrier, such as a dam.

inert - not chemically or physically active.

kick net - a fine mesh net used to collect organisms. Kick nets vary in size, but generally are about three feet long and are attached to two wooden poles at each end.

land uses - activities that take place on the land, such as construction, farming, or tree clearing.

large woody debris- pieces of wood often, but not always defined as being larger than 10 ft long and 6 in diameter (JV).

macroinvertebrate - organisms that lack a backbone and can be seen with the naked eye.

NPDES- National Pollutant Discharge Elimination System, a national program in which pollution dischargers such as factories and sewage treatment plants are given permits to discharge. These permits contain limits on the pollutants they are allowed to discharge.

orthophosphate - inorganic phosphorus dissolved in water.

outfall - the pipe through which industrial facilities and wastewater treatment plants discharge their effluent (wastewater) into a waterbody.

percent total impervious area (PTIA) - the percentage of given area of land (such as a watershed) that is overlain by an impervious material such as asphalt (JV).

periphyton - macro- and micro-algae attached to substrates found on the bottom of aquatic ecosystems; these communities often maintain an intimate association with microbes and an extracellular matrix which all together is sometimes called the Aufwuchs community (JV)

permeable - porous.

pH - a numerical measure of the hydrogen ion concentration used to indicate the alkalinity or acidity of a substance. Measured on a scale of 1.0 (acidic) to 14.0 (basic); 7.0 is neutral.

phosphorus - a nutrient that is essential for plants and animals.

photosynthesis - the chemical reaction in plants that utilizes light energy from the sun to convert water and carbon dioxide into simple sugars. This reaction is facilitated by chlorophyll.

pipet - an eyedropper-like instrument that can measure very small amounts of a liquid.

pool - deeper portion of a stream where water flows slower than in neighboring, shallower portions.

precision - a measure of how close repeated trials are to each other.

protocol - defined procedure.

PTIA - see percent total impervious area (JV).

reagent - a substance or chemical used to indicate the presence of a chemical or to induce a chemical reaction to determine the chemical characteristics of a solution.

riffle - shallow area in a stream where water flows swiftly over gravel and rock.

riparian - of or pertaining to the banks of a body of water.

riparian zone - the vegetative area on each bank of a body of water.

riprap - rocks used on an embankment to protect against bank erosion.

run/glide - see glide/run.

saturated - inundated; filled to the point of capacity or beyond.

sheen - the glimmering effect that oil has on water as light is reflected more sharply off the surface.

sieve bucket - a bucket with a screen bottom that is used to wash macroinvertebrate samples and to remove excess silt and mud.

silviculture - forestry and the commercial farming of trees.

submergent plants - plants that live and grow fully submerged under the water.

substrate - refers to a surface. This includes the material comprising the stream bed or the surfaces to which plants or animals may attach or live upon.

taxon (plural: taxa) - a level of classification within a scientific system that categorizes living organisms based on their physical characteristics.

taxonomic key - a quick reference guide used to identify organisms. They are available in varying degrees of complexity and detail.

titration - the addition of small, precise quantities of a reagent to a sample until the sample reaches a certain endpoint. Reaching the endpoint is usually indicated by a color change.

tolerance - the ability to withstand a particular condition, e.g., pollution-tolerant indicates the ability to live in polluted waters.

tributaries - a body of water that drains into another, typically larger, body of water.

turbidity - murkiness or cloudiness of water, indicating the presence of some suspended sediments, dissolved solids, natural or manmade chemicals, algae, etc.

volumetric flask - a flask that holds a predetermined amount of liquid.

water quality criteria - maximum concentrations of pollutants that are acceptable, if those waters are to meet water quality standards. Listed in state water quality standards.

water quality standards - written goals for state waters, established by each state and approved by EPA.

watershed - the area of land drained by a particular river or stream system.